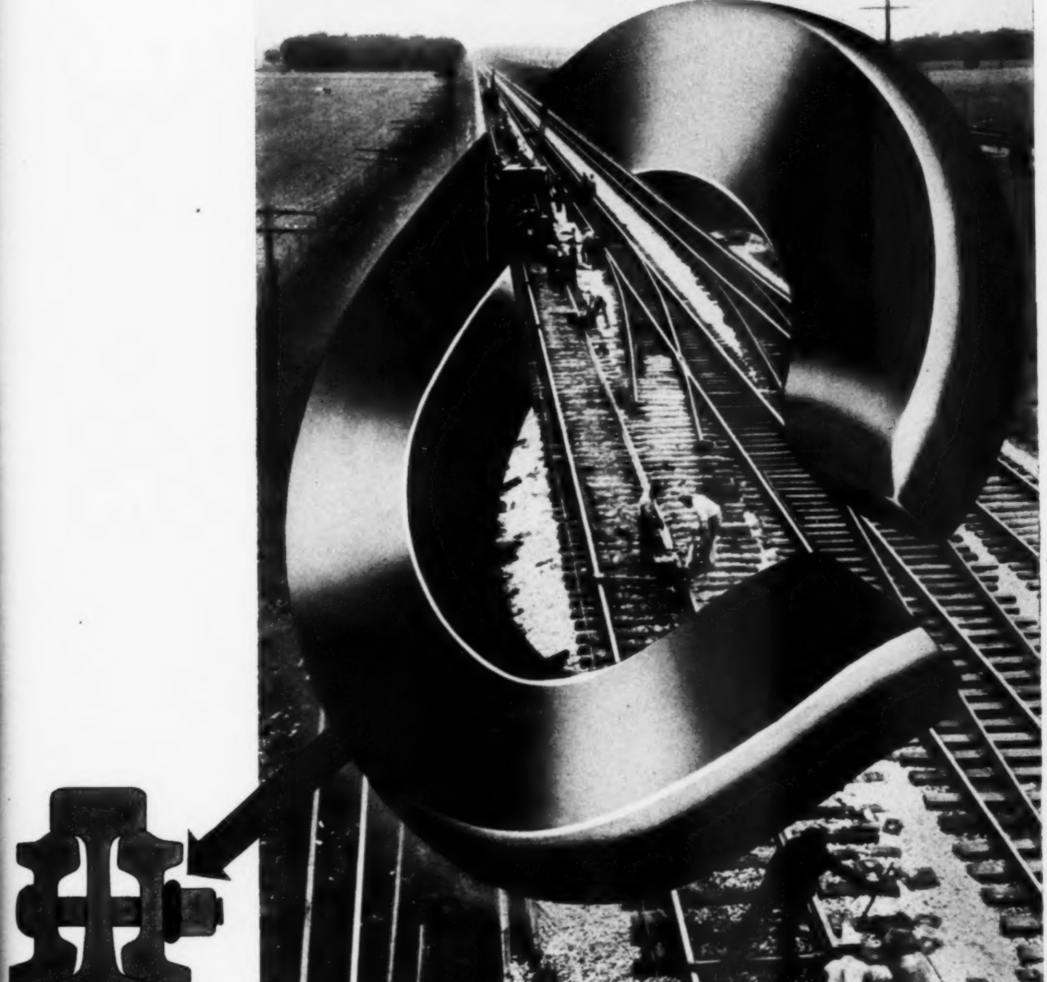
APRIL, 1940

Railway Engineering and Maintenance



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No. 136 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

April 1, 1940

Subject: $117 per Second

Dear Reader:

Some figures have just come to my attention that may be as interesting to you as they are to me. They relate to the purchases made by the railways last year. They were compiled by the Railway Age.

These figures, which were prepared from information furnished direct to that publication by the railways themselves, show that railway buying last year exceeded one billion dollars – $1,014,593,-000 to be exact. Astronomical figures, you say, too large for proper appreciation. All right, let's break them down. On the basis of 300 working days a year, the railways poured $3,381,977 a day into the coffers of industry last year. Even this figure is too large, you say. Correct, I reply, let's divide it still further.

On the basis of the commonly accepted work day of eight hours, this spending amounted to $422,747 every hour of the working day. But even this figure is difficult to appreciate, so let's break it down again – to $7,045 per minute. Coming within our grasp, you say, but break it down still further. All right, it's $117 per second. In other words, every time your watch ticks, the railways of this country spend $117 for materials and supplies required in their operation. Every 8½ times it ticks, the industries of this country receive orders totalling more than $1,000.

And this money goes into a wide variety of channels – almost every industry feels its quickening impulse. It puts millions of men to work. Last year $43,073,000 went for crossties; $4,702,000 for bridge and switch ties; $39,390,000 went for rail; $10,505,000 for frogs, switches and crossings. The railways spent $5,799,000 for track and roadway tools; and $9,000,000 for timber preservatives and $6,550,000 for oxygen. And these expenditures were widely distributed. More than $197,000,000 went to industries of Pennsylvania; Illinois benefitted to the extent of $132,000,000; some $67,622,000 went to industries of Indiana; New York received $52,455,000; California $49,262,000, etc.

These figures are indicative of the volume, diversity and distribution of the purchases made by the railways in a definitely subnormal year, and of the impetus given a wide variety of industries throughout the land. Don't you think that they should cause every citizen who is thoughtful of the well being of his country to be concerned over the continued maintenance of this contribution to the industrial life of the country?

Yours sincerely,

Elmer T. Howson

Editor

ETH:KR

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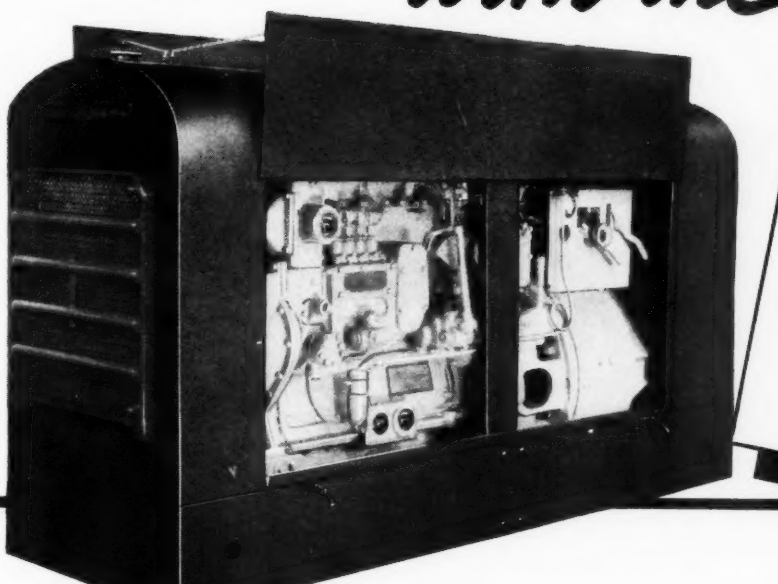
IN YOUR 1940 MAINTENANCE PROGRAM

Cut WELDING COSTS *with the* NEW G-E "Caterpillar" Diesel-driven Arc Welder



IF your 1940 plans include welding for general maintenance on track and structures, don't fail to investigate the new G-E "Caterpillar" diesel-driven arc welder. It's the lowest-priced welder providing both the inherent fuel economy of a diesel and the dependable performance which permits this economy to be *fully* realized.

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(5) Force-feed lubrication with a separate oil cooler and a two-stage filter assures adequate lubrication, increases oil life, and avoids excessive maintenance.

(6) Special oil-bath air cleaners on both diesel and starting engine assure clean combustion air and prolong engine life.

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(8) An hour meter indicates when various engine parts should be lubricated.

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Railway Engineering and Maintenance

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APRIL, 1940

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Railway Engineering and Maintenance

Records

New Levels of Efficiency

IN these days when so many critics are charging the railways with lack of progressiveness in meeting the changing needs of industry, it is heartening to note the many new records of performance that are being made. As the figures for 1939 are becoming available, it is seen that the railways attained new high levels of efficiency in numerous directions last year—records that are all the more noteworthy by reason of the wide fluctuations in traffic that characterized the year.

With respect to traffic, the increase in car loadings in September and October of last year was the largest for any similar period in the history of the railways. Yet the roads handled it without congestion, delay or car shortage and with an efficiency that won wide recognition. These records provide further evidence of the alertness of railway managements and employees in meeting the transportation needs of the public wherever and in whatever form they may arise.

New Records in Safety and Freight Claims

Most important among these records, from the standpoint of the public, is that with respect to safety of patron and employee. In this year (1939) fewer persons lost their lives in railroad accidents than in any year since the Interstate Commerce Commission began the compilation of these statistics in 1888. Especially noteworthy is the record made with respect to employees, for fewer employees were killed and injured, in comparison with the number of hours worked, than ever before. As compared with the previous record year of 1938, the fatality rate among employees was reduced 2.6 per cent and the injury rate 2 per cent.

Likewise, fatalities to trespassers on railway property were four less in 1939 than in 1938, while the number of fatalities resulting from accidents at railway-highway grade crossings was the smallest since 1915. And trespasser and grade crossing accidents comprised 86 per cent of all fatalities connected with the railroads in 1939. Only in accidents to passengers was the record other than a new minimum and even here 9 of the 13 passengers who lost their lives in train accidents last year came to their death in one accident that was the result of sabotage.

Turning to the transportation of goods, the amount of each $100 of freight revenues that went for payments for loss and damage fell to 56 cents, a decline of 17 cents in the one year. Stated in dollars, payments for loss and damage to freight declined from almost $120,000,000 in 1920 to less than $19,000,000 in 1939, a reduction of 84 per cent.

Especially outstanding has been the elimination of losses due to theft, from a total of almost $13,000,000 in 1920 to $420,000 in 1939. So efficient has railroad policing become that convictions are being obtained in 99 per cent of all cases tried.

Take a specific commodity, explosives, most difficult to handle without accident. Last year, the railroads transported approximately 500,000,000 lb. of dynamite, black and smokeless powder, blasting caps and other high explosives without accident, death or injury to any person. This was the thirteenth consecutive year in which there has not been a single person killed or injured in the transportation of billions of pounds of explosives.

Further Improved Operating Indices

Turning to more specific operating indices, the railways attained a new high record in speed of freight trains last year, 16.7 miles per hour, this speed being 62 per cent higher in 1939 than in 1920. Thus, for a 24-hr. day, the average distance traveled per freight train was 401 miles in 1939, as compared with only 247 miles in 1920.

The railways demonstrated their efficiency in similar manner in fuel consumption, for they hauled 8.89 tons of freight and equipment one mile for each pound of fuel consumed, another high record. This compares with an average of only 5.8 tons in 1920. Expressed in another way, the railways consumed 112 lb. of fuel in hauling 1,000 tons of freight and equipment one mile in 1939, while in 1920 they consumed 172 lb.

Records Reflect Alertness

Records such as these demonstrate that the railways—managements and employees alike—are alert to the opportunities to raise already enviable records of efficient performance to still higher levels. They place railway service on a new high plane—whether measured by safety to person or to parcel or by most economical movement.

This is a record in which every railway employee may take pride. It is a record which he has helped make. It

is a record which he should bring to the attention of critics and others who may be more kindly disposed towards the railways and their problems.

The Human Element

Still the Key to Accident Prevention

IN an address before the Twenty-Eighth National Safety Congress of the National Safety Council, abstracted later in this issue, O. F. Gnadinger, supervisor of safety, of the Elgin, Joliet & Eastern, emphasized a fact that must be recognized by railway officers and employees before much further progress can be made in accident prevention. This is, that there can be no complete solution of the accident problem among railway employees, and, particularly among those in maintenance of way and structures work, until the human element can be more closely controlled.

While the human element has always been recognized as a most important factor in accidents, the fact that the railways have thrown so many safeguards about most work operations, eliminating many other contributing factors, serves to make the man element stand out even more. Today, through the protecting shields or enclosures that are placed about the moving parts of machines, there is no way in which certain classes of accidents of the past can be duplicated. Likewise, through the use of work equipment for many of the heavier classes of work, which formerly required strenuous physical exertion, and the development of gang organizations and methods which prevent the congestion of men while carrying out operations, many other classes of accidents have been almost completely eliminated, accidents which may be said to be due primarily to causes largely beyond the immediate and primary control of the men.

Obviously, the elimination of such accidents tends to throw into greater relief those accidents in which the human element is the primary or controlling factor, with the result that it is not surprising that safety men are concentrating their efforts to a greater extent than ever before upon those factors which go to make up what is broadly termed the human element. Thus, while there is no thought of overlooking the more tangible phases of the safety problems, there is now greater concentration of interest in the experience and the mental and physical fitness of new employees, and appropriate delegation of duties and special tasks in accordance with the physical condition or ability of the men available; more intensive safety education among the men; and an insistent demand for closer supervision of the methods employed by workmen by the foremen, supervisors and others who may be placed in responsible charge of work.

In view of these facts, it is not surprising that Mr. Gnadinger says that the most important element in accident prevention in the maintenance of way department today is good supervision, because it is evident that in good supervision are to be found all of the foregoing factors relating to the proper selection, training and use of men. Without good supervision, he points out, the railways cannot hope to go very much further in accident prevention. If this is true, it puts accident prevention in the maintenance of way department squarely up to maintenance of way officers down to and including foremen, to a greater extent than ever before. And, in view of the vital interest of railway managements in this problem, and their insistence that safety records be still further improved, it should be considered as their most important problem.

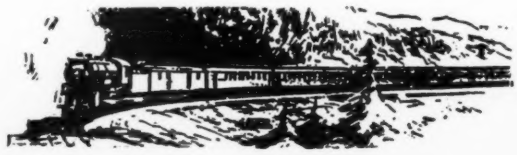
Motor Trucks

Proving Valuable in Snow Removal Work

WITH the passing of winter it is desirable that attention be directed at this time to a development in snow removal methods which received further test during the last winter and which, as a result, appears to offer large possibilities for increased effectiveness and economy in the future. This is the use of motor trucks for loading out and disposing of snow, particularly in terminal areas, in lieu of the use of work trains.

While snowplows and flangers continue to prove themselves effective for line work, and various types of switch heaters provide the answer to keeping switches open, it has long been recognized that the use of work trains for loading out and disposing of accumulated ice and snow within and about busy yards and terminals, with the large expense and occupation of tracks which they require, is not the ideal solution. In fact, in view of the greater intensity of both passenger and freight operation in recent years, and the increased demands for economy in all classes of work, many roads have found the work-train method of snow disposal impracticable and have employed it only in cases of greatest emergency, and then only because of the lack of a suitable substitute.

Confronted with this problem, several roads have experimented with the use of motor trucks in snow removal work with considerable success, and an important terminal division of one road has turned to the truck method exclusively for the last two years to large advantage. Relying upon the truck fleets of contractors with whom prior arrangements have been made, this terminal division has found that an adequate number of trucks is always readily available, and that the trucks are not only adapted for use at any of the points formerly served by work trains, but are also suited for hauling snow and ice from many locations where the use of work trains would be impracticable or impossible. In and about passenger and freight stations the trucks have been operated over platforms and track areas with almost equal facility, moving out or adjusting their positions quickly with varying conditions of traffic, and



within yards and engine terminals there have been few locations that they could not reach, being operated across tracks almost as readily as longitudinally along or between them. They have also been found highly effective for removing snow at outlying points, and especially at highway crossings at grade where the snow has been piled on the tracks by the operation of highway clearing equipment. Along with these factors of practicability, the motor trucks have cost only a small fraction of that involved in work-train operation, being rented for $1.50 to $1.75 an hour and released promptly upon the completion of the work.

If these advantages and economies in the use of motor trucks for snow removal work have been demonstrated in one large terminal area, it is not unlikely that they would also be found in other similar terminal areas. In any event, both the practical and economic advantages cited would appear important enough to warrant a thorough investigation of the trucking method of snow removal by other roads before they again face the problem of preparing to meet winter storms.

Section or Extra Gang

Which Is More Effective Today?

FEW subjects have been more prolific of discussion in recent years than that of the relative advantages of section and extra gangs for routine maintenance tasks, particularly with respect to renewing ties and general surfacing which does not require the application of ballast, except so far as this may be necessary to fill out the ballast section. Both the section and the extra gang have their proponents, who consider the reasons for their points of view concerning the use of these gangs for the purposes mentioned to be good and sufficient, for which reason neither side seems to be deeply impressed by the arguments of the other.

Renewing ties and surfacing track, except when applying ballast, have always been considered to be special prerogatives of the section forces. No section foreman has ever been willing to have these tasks delegated to extra gangs, for he is firmly convinced that an alien gang will have no interest beyond that of maintaining production, and that it will, therefore, not do as good a job as he will insist on doing with his own forces. This attitude is not confined to foremen, however, for many roadmasters and supervisors are of the same belief, and even division engineers and engineers of maintenance of way have been known to advance the same argument.

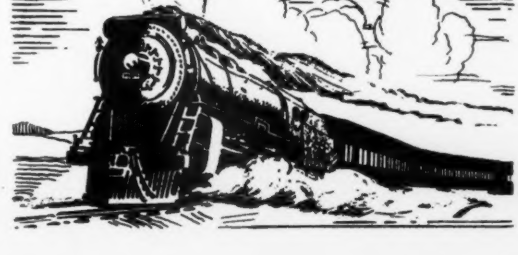
On the other hand, the cold logic of the demand for greater economy in maintenance cannot be met by opinions unless they are supported by facts that prove them to be fundamentally correct. It is not denied that in many cases these complaints on the part of section foremen have been fully warranted, but no supervisory officer can advance such a reason for limiting the activities of extra gangs without admitting a general laxity in his supervision over their work. Furthermore, the ratio of supervision to the total wage and to the output per man-hour is far higher in a section, even in an expanded section gang, than in an extra gang.

An extra gang can be equipped with power tools that will increase its output per man-hour, while decreasing the physical effort required of the individuals comprising the gang. It is not economically feasible to provide such equipment for section gangs, for the nature of their work precludes the possibility that they will use it a sufficient proportion of the time to make the investment profitable.

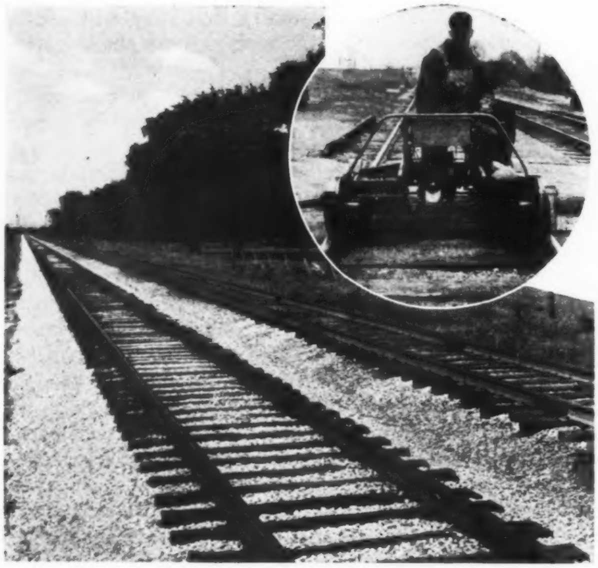
In a well organized extra gang, each man will be assigned to the task for which he shows the greatest aptitude, so that through experience and training his output will increase automatically without any increase in the effort he expends. Furthermore, he is given the particular tool he will need in his assignment, and, since with few exceptions he will need no other, no time is lost in laying down one tool and hunting for another. In contrast, the members of a section gang can rarely be given specific assignments, but must ordinarily perform all of the operations called for by the work they are doing. While some of them may become quite proficient in all of these operations, this proficiency will vary with the individual aptitudes, and others may never learn to perform some of the operations satisfactorily. In addition, much time that might otherwise be productive is wasted in changing from one kind of work to the other, including the time spent in hunting for the tools needed for the new assignment.

It is not contended that the use of extra gangs offers the solution for all problems of economy and the effective use of labor under present conditions in maintenance. There may be little wisdom and less economy in using an extra gang where tie renewals are light, for more time may be spent in advancing the force than in actual renewals. There are also instances where surfacing is badly needed over relatively short disconnected stretches of track, where the cost of moving the larger gang from point to point and the time lost in such moves, will more than offset the higher basic cost of the smaller local gangs.

Because of the changes that many factors have been and are introducing into maintenance of way practices and organizations, no maintenance officer can afford to assume that this or that plan of doing his work is superior to or more economical than other methods. Rather, he should make a careful and detailed analysis of his requirements and plan his work accordingly, making sure that he has not overlooked any items that will make his work less expensive or more effective. In other words, preconceived ideas have no place in today's maintenance programs unless they have been subjected to searching analysis and it can be proved that they can survive on the basis of merit and are not based merely on custom or preference.



Track Supervisor System—How Efficient?



The Supervisor Patrols His Territory on a Light Motor Car Every Working Day, Relieving the Foremen of This Responsibility

This article, which describes the development of the track supervisor system on the Burlington and the Rock Island was adapted and enlarged from a report presented before the convention of the American Railway Engineering Association, in March, by a subcommittee of the Committee on Economics of Railway Labor, of which H. A. Cassil, chief engineer, Pere Marquette, was chairman

EARLY in 1931, in recognition of the increased strength and security that had been built into their tracks during the preceding 8 to 10 years, and, convinced that the serious decline in business then underway throughout the country was more than temporary, the maintenance of way officers of the Chicago, Burlington & Quincy, followed shortly by those of the Chicago, Rock Island & Pacific, gave serious consideration to the reorganization of their track forces to the end that economies might be effected in carrying out the work of these forces without in any way lowering the general standards of maintenance. As a result, both of these roads brought about reorganizations of their track forces under what soon became known as the "track supervisor system," reorganizations which time has shown have overcome the disadvantages of reducing section gangs to an impractical size, increased the effectiveness of the track forces, minimized the unproductive time spent in patrolling track and increased the quality and intensity of supervision over all classes of work.

The fundamental features of the reorganizations set up involved the lengthening of the track sections to obtain fewer but larger gangs, and the creation of track supervisors, interjected between section foremen and district roadmasters, with the primary responsibilities of direct supervision over the routine work of the track forces and of patrolling the tracks. This latter responsibility placed on the supervisors was one of the main features of the new system, designed to relieve the section forces of this large, time-consuming responsibility, with the disorganization which it caused in their productive operations.

On both the Burlington and the Rock Island, the daily patrol of main line tracks was considered necessary. Under the old set-up, the foreman, accompanied by enough laborers to handle a motor car, patrolled his section each day. This procedure resulted in 15 to 25 per cent or more of the time of the section forces being spent unproductively from the standpoint of the actual performance of work, depending upon the length of section, size of gang and density of traffic. Under the track supervisor system, each supervisor does all of the patrolling for the section gangs under him, in addition to his other responsibilities.

The supervisor system of organization was adopted by the Burlington and the Rock Island only after a thorough study and investigation of other possible means of accomplishing the desired results, including the use of large specialized gangs for at least all of the heavier, more important maintenance operations, supplemented by skeleton section forces employed only for spot work and general care of the right-of-way. The system was put in effect on parts of these roads in 1931 and 1932,* and was subsequently expanded gradually until today it extends over approximately 90 per cent of the main line mileage of both roads.

Features of System

In general, under the system as installed, main line sections were lengthened from 7 or 8 main track miles to 10 or 12 main track miles, depending on local conditions, and branch line sections were lengthened from 9 or 10 miles to 12 or 15, and in some cases, 20 miles. Roadmasters' territories were lengthened from 100 to 200 miles of main line to 200 to 300 miles of line, depending upon the type of territory, and track supervisors were appointed with territories including 60 to 70 miles of main track and with jurisdiction over 6 or 7 sections.

The track supervisors were given light one-man motor cars to carry out their responsibility of daily patrol of their territories, as well as to enable them to travel from gang to gang in their routine duty of supervising operations. On some branch lines where no track supervisors were employed

*A description of the beginning of the track supervisor system on the Chicago, Burlington & Quincy was published in an article beginning on page 39 of the January, 1932, issue, entitled, "Does Our Organization Meet Today's Conditions?" by H. R. Clarke, at that time general inspector of permanent way, and now engineer maintenance of way. A similar article describing the establishment of track supervisors on the Rock Island appeared on pages 621 and 622 of the October, 1932, issue of *Railway Engineering and Maintenance*.

the unproductive time required for patrolling the track was reduced by patrolling only once every two or three days, depending upon the class of line.

In addition, to further conserve the time of the section forces for productive work, the track supervisors on both roads were assigned the task of filling switch lights, except in yards, and the daily inspection of all main line switches. The supervisors of both roads also supervise the spotting of ties for yearly renewals and the handling of such work equipment as ditchers, weed mowers, weed burners, etc., over their territories, except when this equipment is accompanied by the roadmaster.

In this system the supervisors see each foreman every day, spending more time with the less competent foremen, programming the work and giving intensive supervision to produce more uniform standards of maintenance. The supervisors report to the roadmaster and, in-so-far as possible, are relieved of all correspondence and administrative duties. Roadmasters on both roads report to the division superintendents and district engineers maintenance of way.

When the system was first established on both roads it was planned to work to a 60 to 70 mile territory for the track supervisors in order that they would have sufficient time to spend with the foremen each day, to plan the work, inspect switches and inspect track conditions where required. Local conditions, however, made the establishment of longer territories necessary in a number of cases. In the assignment of supervisors' territories, effort was made to locate their headquarters in towns where good living accommodations could be obtained and to have headquarters at points where telegraph service was available in case of emergencies and for securing daily motor car line-ups. Territories were also located so far as possible to avoid unnecessary doubling at either end.

Differences on Two Roads

There are a number of minor differences between the track supervisor systems on the Burlington and the Rock Island. In double-track territory the Burlington assigned its supervisors about 66 miles of main line or 132 miles of main track. The Rock Island at first gave its supervisors only 30 to 35 miles of double track main line or 60 to 70 miles of main track but later lengthened these territories to approximately 70 miles, the supervisors patrolling one track one day and the other the next, inspecting all main-line switches on both tracks every day. Supervisors on the Rock Island must also inspect main-line switches in automatic signal territory with the signal maintainer once every two weeks.

In automatic signal territory the Rock Island track supervisors patrol every week day and are off on Sundays and holidays while in non-automatic signal territory they patrol on Sundays and are off on Wednesdays, on which day the section forces patrol their own sections. On the Burlington the track supervisors patrol on every working day and both track supervisors and section forces are off on Sundays and holidays. On this road the jurisdiction of the supervisor is confined to the main line in terminals and extensive yards while the roadmasters generally accompany all heavy work equipment or work trains working on their territories, leaving the supervisor free to supervise routine work.

Although the section foremen are under the jurisdiction of the track supervisors on both the Burlington and the Rock Island, actual responsibility for the condition of his section has not been taken from the foreman by the track supervisor system. The section foremen are also held responsible for patrol in case of emergencies in which the track might be endangered, such as heavy rains, etc. The track supervisors are not called for work of this kind, but in case of actual trouble they furnish a quickly available source of experienced supervision and for this reason on both roads the track supervisors runs are scheduled whenever possible to move in the same direction daily to keep them spaced, so that a supervisor may be quickly available at any point at any time.

When track supervisors were first installed, although the sections were made longer, the total number of laborers per mile of track remained nearly the same, and, as a consequence, the gangs were larger. However, reduced earnings later necessitated further reduced maintenance allowances and the number of track laborers per mile of track was reduced somewhat in the following years. That the track supervisor system, in the face of this obstacle, was able not only to maintain the same high standards of maintenance that previously existed, but actually to show improvements that kept pace with the speeding up of train schedules in general, and the establishment of streamlined trains, is probably the most outstanding proof of its efficiency.

The savings which were brought about by the installation of the track supervisor system are very considerable. On the Burlington a comparison of a typical main-line division in the latter part of 1931 was as follows:

	Before Supervisors	After Supervisors
Mileage—all main line	353	353
Number of roamasters	3	2
Number of supervisors	—	5
Number of foremen	52	30
Average length of sections	6.75 miles	11.70 miles

The actual reduction of payroll expense on this division amounted to $31,495 a year, and later, by further consolidation, roadmasters' territories were extended from 175 miles to 225 and 250 miles.

On a typical 750-mile division on the Rock Island, the track supervisor system, when first installed, showed an approximate saving of $60,000 annually. On this division 37 sections and one roadmaster's district were eliminated and 10 track supervisors

Close Supervision Is Maintained Over All Routine Maintenance Operations, Including the Tie Renewal Work

were appointed. By the latter part of 1932 the Rock Island had established supervisors on seven divisions, eliminating 176 sections and appointing 57 supervisors. On these divisions the saving, based on a normal force of trackmen, was estimated to be $222,411 annually. Today, with a further extension of the track supervisor system on both railroads, still greater savings have been realized, as compared to the old maintenance organization.

At the present time on the entire system of the Rock Island, depending upon the season, monthly savings of approximately $25,000 to $35,000 are realized with no allowance credited for savings due to reductions in the cost of operation and maintenance of section motor cars, retirement of section and tool houses and the savings in tools furnished, etc., as these are offset in part by the added expense of motor cars for the track supervisors.

Further Comparison

A further comparison of the two systems of supervision installed on the Rock Island and the Burlington may be gained from a comparison of the supervisory maintenance forces now employed on the Chicago-Omaha lines of both roads, which lines pass through similar territory and are comparable in density of traffic and in a number of other respects.

On the Rock Island, the line from Chicago to Council Bluffs, Ia., is 499 miles long. The ballast is nearly all gravel, with the exception of a few places where cinder ballast is used and this territory is laid with 100-lb., 110-lb. and 112-lb. rail. The time-card speed from Chicago to Des Moines is 90 m.p.h. for Rocket trains, 70 m.p.h. for other passenger trains, and 50 m.p.h. for freight trains, and from Des Moines to Council Bluffs, 80 m.p.h. for Rockets, 60 m.p.h. for other passenger trains and 45 m.p.h. for freight trains. In this territory, excluding the Chicago Terminal division, and the Moline-West Davenport and the Des Moines terminal territories, there are 223.5 miles of double track and 246 miles of single track, on which there are 2.92 roadmasters and 7.87 track supervisors, with 71 foremen (27 on single track and 44 on double track territory). The average length of sections on double track is approximately 5.07 miles of main line or 10.14 miles of main track. The average length of sections on single main track is 9.1 miles. The average length of territory for track supervisors is 74 miles of double track and 79 miles of single track. The roadmasters' territories on this line vary considerably; some of them have extensive terminal trackage under their jurisdiction and others have other main line or branch line trackage.

On the Burlington, the line from Chicago to Council Bluffs is 492 miles long. From Chicago to Aurora, Ill., 38 miles, there are three main tracks, the remainder consisting of 413 miles of double track and 41 miles of single track. Nearly all of this track is ballasted with gravel or chatt ballast and occasionally some cinders. The rail on the Burlington in this territory is also of 112-lb., 110-lb. and 100-lb. section. On the Burlington main line from Chicago to Council Bluffs (excluding the territory from Chicago to Aurora, for purposes of comparison), the following table presents a comparison of the maintenance forces before and after installation of the track supervisor system.

On the territory from Aurora to Galesburg the saving in salaries is estimated at $765 per month plus a credited saving of $126.50 (one-half the salary of a roadmaster), or a total of $891.50 per month, representing annual savings of $10,698. This does not include any credit for a slight reduction in the total number of laborers or credit for tool houses, motor cars, tools, etc. On the same basis, establishment of the track supervisor system on the line from Galesburg to Council Bluffs showed a monthly saving of $1,227.60, or $14,731.20 annually. The average gross tons handled per year on this line are approximately 8,000,000 westbound and 11,000,000 eastbound between Aurora

Aurora to Galesburg	Before Track Supervisors	After Track Supervisors
Miles of double track (main line)....	124	124
Number of sections....	31	22
Average length of section (main track miles)	8.0	12.0
Average miles of side tracks per section....	2.7	3.5
Number of supervisors	—	2
Average length of supervisors' territories (miles of main track)	—	124
Number of roadmasters	1.5	1

Galesburg to Council Bluffs	Before Track Supervisors	After Track Supervisors
Miles of double track (main line)...........	289.4	289.4
Miles of single track (main line)...........	40.6	40.6
Number of sections..	76	63
Average length of section (main track miles)	8.15	9.82
Average miles of side tracks per section....	2.72	3.28
General foremen........	1	—
Number of supervisors	—	5
Average length of supervisors' territory (miles of main track)	—	123.9
Number of roadmasters*	5	4

*Note: These roadmasters also have considerable branch line territory.

and Galesburg, and 5,900,000 westbound and 5,000,000 eastbound between Galesburg and Council Bluffs.

That the track supervisor system has proven its efficiency is no longer questioned on either road. In fact, shortly after it was established, it became popular with most of the foremen, who, without the necessity for patrolling, were able to spend more time on other important work. The system is especially popular with the roadmasters, who soon began to realize that the supervisors were proving very valuable assistants by taking responsibility for many details that the roadmaster could not otherwise efficiently look after.

Another considerable benefit of the supervisor system aside from its economy, is the opportunity it presents for giving outstanding foremen and young engineers valuable training in maintenance supervision, fitting them for the position of roadmaster. On the Rock Island approximately 70 per cent of the track supervisors are former section foremen and the remainder were selected from young engineers. On the Burlington nearly all of the track supervisors are former section or extra gang foremen.

Line and Surface Are Watched Carefully During Each Trip Over the Line and the Foremen Are Advised of the Spotting and Lining Work Required

The "Human Element" Still the Key to Accident Prevention*

A Large Proportion of Accidents Occur While Handling Heavy Materials

We know about what to expect in the way of accidents, says Mr. Gnadinger, but we are still faced with the problem of what to do to eliminate them, particularly those involving the "human element". Also, he discusses the problem in accident prevention presented by the use of unskilled labor in the maintenance of way department, and stresses the importance of supervision in promoting safety

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IN every industry the usual and common causes of accidents are well known and it is only rarely that a new or unusual cause makes its appearance. In other words, we know just about what to expect as to accident causes, but we still are faced with the problem of what to do to eliminate them. By guarding machinery, improving working conditions and methods, furnishing safety equipment, etc., we have eliminated many of those causes that formerly produced large numbers of accidents and have greatly reduced the importance of others. However, we are still somewhat in the dark as to those accidents that involve what we term the "human element," although considerable progress is being made in their prevention through educational work.

Accidents 10 Years Ago

For the purposes of this paper I have taken at random from the records of 10 years ago 200 maintenance of way accidents causing a loss of time from work, which are listed by causes in the accompanying tabulation. By studying this tabulation in the light of knowledge concerning the character of present-day accidents, it becomes evident that none of the causes has been eliminated. This is due mainly to the fact that we have not learned how to combat those causes that involve the human element. Perhaps there is some deep-seated reason for these causes that never has been touched upon, and never will be unless we see and think much further ahead than we do today.

It will surprise no one to note that more than half of the accidents listed occurred during the handling of material. In recent years accidents from this source have been greatly reduced through improved equipment and methods, but it remains, and probably will continue as such, the most prolific cause of accidents in the maintenance department. My experience has been that many such accidents are due to some thoughtless act on the part of the injured person or a fellow-workman; to lack of knowledge as to the proper way in which the material should be handled; or to the lack of proper instructions or supervision by the foreman. Some of this type of accidents are due to the physical condition of the injured person.

Causes of 200 Maintenance of Way Accidents Occurring 10 Years Ago

Handling Material		
Material falling (ties, rails, etc.)	91	
Caught under or between	23	
Struck by	3	
Sharp edges	1	118
Using Hand Tools		
Struck by	17	
Struck by chips	7	
Chips in eye	3	
Defective tool	1	28
Falls		
Slipping or tripping	12	
From cars	4	
From ladders or scaffolds	3	19
Motor-cars, hand-cars or trailers		13
Sprains or strains		11
Struck by car or engine		4
Struck against some object		4
Struck by auto at crossing		2
Burns		1
Total		200

Use of Hand Tools

Accidents occurring during the use of hand tools come next in importance, accounting for 14 per cent of the total. Thoughtlessness or carelessness (whichever we may choose to call it) played an important part in causing the majority of the accidents in this classification. Only one of them was caused by a defective tool.

Falls accounted for about 10 per cent of the accidents, slipping or tripping at ground level being the greatest single cause in this classification. Of the three accidents listed under falls from scaffolds or ladders, one was traceable to the failure of the foreman to have a railing installed before per-

*Abstract of an address presented before the Steam Railroad Section of the National Safety Congress.

mitting his men to start their work.

Motor-cars, hand-cars and trailers accounted for about six per cent of the accidents. Some of these were chargeable to improper supervision—to failure to observe properly the rules governing the use and operation of such equipment. Others were due to the thoughtlessness of the injured person. Passing on through the list, we find five other causes familiar to all of us. Of the 11 accidents involving sprains or strains, some undoubtedly were traceable to the poor physical condition of the injured persons. Others were due to improper working methods or the lack of proper supervision. The remaining four classifications of accidents speak for themselves.

Same Causes Prevail Today

As stated, these 200 accidents were taken from records of more than 10 years ago. I believe that if we were to take an equal number from the records of this year or of last year we would find the same causes prevailing in about the same relative ratios. The reason for this, of course, is the ever-present involvement of the human element in each of these classifications. Through safety education and better supervision the number of accidents has been greatly reduced, and, in my opinion, will be reduced still further only through continued activities along these lines.

Many Accidents Occur Through the Improper Use of Hand Tools

In the maintenance department we are confronted with a situation that is not encountered in other departments—at least not to the same extent. I have reference to the fact that the majority of the employees in this department come under the heading of what we term "unskilled labor." I refer, of course, to the trackmen or section laborers. Since such employees normally do not have any special training and, in some instances, are without adequate instruction, it is only natural that they should meet with accidents.

As we all know, in years gone by when 10, 50 or 100 men were sought as track laborers, it was usually a matter of first-come, first-hired. Physical fitness was not required beyond the ability to do a fair day's work; neither was experience an absolute necessity. Men were hired whose knowledge of our language was so limited as to permit almost no communication between themselves and their fellow workmen or the foreman. Inexperienced men were given only scanty instruction, usually being placed with experienced men and left to their own devices. More than once I have come in contact with such instances, usually when inquiring why certain foremen were having an unusual number of accidents in their gangs.

Physical Condition Important

Physical fitness is important in the maintenance department just as it is in any other department. Nearly every railroad requires that an applicant for a position in the transportation department pass a rigid physical examination, and he is also subjected to an equally rigid periodical examination. I do not say that employees in the maintenance of way department should be subject to such rigid examinations, but when new men are hired they should at least be passed upon by a company surgeon, and required to have good sight and hearing, full use of their limbs and bodies, and to be free from hernia or any chronic ailment.

It cannot be denied that a physically unsound employee represents a poor accident risk, regardless of the class of work he is doing, and there is no doubt that a great many accidents in this department would be eliminated if only physically sound men were employed. We may find in this aspect of accident prevention a partial solution to the problem of eliminating accidents we now attribute to the human element.

Experienced Men Desirable

Under present-day conditions it should not be difficult to secure experienced men for maintenance work. Certainly this is desirable. However, if inexperienced men are employed, it is the strict duty of the foreman to give them thorough instruction in the work to be done, to point out the hazards to be encountered and how to avoid them. We may call this class of labor unskilled if we choose, but the dangers involved are many and they can and do produce serious accidents.

If I were asked to name the most important lesson I have learned through the investigation of accidents in the maintenance department, my reply would be that "accident prevention in the maintenance of way department is almost entirely dependent upon *good supervision.*" Given a foreman interested in this phase of his work, as compared with one who is indifferent, and it will be found that his men are suffering fewer accidents.

The Safe Foreman

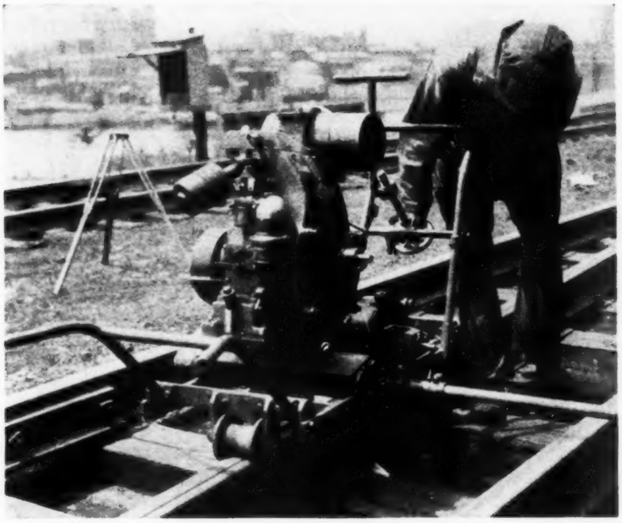
The foreman interested in the safety of his men will instruct them in the proper way that material should be handled. He will not only instruct them but he will show them; not once, but over and over. He will impress upon them that it is not what they handle but how they handle it that is the primary factor in accident prevention. The same foreman will require that the tools and equipment used by his men are kept in safe and usable condition. He will not permit the use of defective tools or makeshifts. He will insist that his men wear their goggles as required.

He will aid in reducing accidents caused by falls by ascertaining that underfoot conditions are as safe as it is possible to make them. He will watch and instruct his men when it becomes necessary for them to climb on cars. He will see that all ladders and scaffolds are in good condition and properly protected. He will operate motor-cars or hand-cars in strict accordance with the rules governing their use, and will require his men to do likewise. By watching the physical condition of his men he will eliminate many of the accidents due to sprains or strains. By constant supervision, by looking ahead, he will eliminate, or at least, reduce those accidents under the remaining classifications, together with others not shown but with which all of us are familiar.

It may be said that I am describing a paragon of virtue and a joy to safety men who does not and never will exist; but I do not think so. I know foremen who answer completely to this description. They seldom have occasion to make out an accident report. They realize that the prevention of accidents is an important part of their work. Their work does not suffer by reason of their interest in accident prevention; if anything, by reason of this interest, their work is carried on more efficiently.

Given safe working conditions, safe methods and safe equipment, only one other element is required in the prevention or reduction of accidents. This element is good supervision; without it we will not go very far in accident prevention.

Inserts Copper Strips in Rails To Prevent Signal Failures



A Grinding Machine with Special Alterations Is Used for Grooving the Rail Head

To preclude the improper functioning of signal circuits at infrequently-used turnouts because of the presence of rust on the rails, the Pennsylvania has adopted the practice, which has been a matter of experiment on one or two other roads, of inserting strips of copper in the running surfaces of these rails. This article reviews the development of this practice and gives an account of the methods employed in making the installations

BECAUSE of the accumulation of rust on the running surfaces of rails at infrequently-used turnouts and crossovers carrying track signal circuits, it occasionally happens that the circuits fail to shunt during the passage of equipment, thereby resulting in improper functioning of the signals and electric interlocking circuits. On the Pennsylvania such turnouts or crossovers are being subjected to a special form of treatment, involving the inlaying of strips of copper in grooves or slots in the running surfaces of the rails, which expedient has proved effective in preventing signal failures at such locations.

First Tried in 1937

The first installations of this type were made in 1937 and it is felt that they have now been in service a sufficient length of time to demonstrate the merit of the method, both as to its effectiveness in preventing signal failures and also as to the permanence of the copper strips. To date, a total of eight such installations have been made and at none of them has further trouble been experienced with the signal circuits, nor have the copper strips shown any tendency to become loose or to rise out of the grooves.

In seeking a solution of the problem presented by the presence of rust on the running surfaces of rails in turnouts that are not used sufficiently to cause the rail surfaces to be kept clean by the moving wheels of equipment, the railroad came to the conclusion that the desired results could be attained by inserting in these rail surfaces continuous strips of a metal having a slower rate of oxidation than rail steel. The reasoning was that the surfaces of such strips would be kept free of oxide by even infrequent movements over the rails and that, as a consequence, there would be no obstruction to the passage of current between the rails and wheels, and difficulty with the signal circuits would be obviated.

Since copper oxidizes slowly and is a good electrical conductor, it was chosen as the material for the strips, which are 3/16 in. by 3/16 in. in cross section, are of soft-drawn metal in lengths of 8 ft. to 14 ft., and are inserted in continuous longitudinal grooves ground in the running surface of the rail at a distance of one inch from the gage side (to the near side of the groove). The strips are placed in both rails and at turnouts they are extended to the insulated joints in the side track. At crossovers the strips are placed in the rails throughout the lengths of both turnouts as well as in the connecting track between them.

It is not considered necessary to extend the copper strips to the ends of the switch points and they are terminated at about the point where the planing of the switch rails begins. Moreover, at frogs it is not readily possible to bring the copper strips nearer than to within several feet of the point from either direction. However, the installation of the copper strip within these limits is not considered essential for the reason that equipment moving over the turnout or crossover will always have some pair of wheels in contact with rails equipped with copper stripping. To preclude the possibility of bridging insulated joints, the copper strips are not brought closer than 2 in. to the ends of the rails at such joints. At ordinary joints the copper strips are extended to the rail ends. Thus, throughout the length of the turnout or crossover the strips are interrupted in their continuity only at the joints and the frogs.

As stated previously the treatment of turnouts with copper strips was first undertaken during the latter part of 1937, two installations of an experimental nature being made at that time at Parkesburg, Pa., and at Lock Haven. In both of these early installations the copper strips were inserted in the rails in the company's reclamation plant at Chambersburg, Pa., and in both cases the edges of the grooves were undercut slightly during the grinding operation to insure that the copper strips would be held firmly in place. It required only a short period of service for these

Copper Strip in Place Just After Insertion

installations to demonstrate the efficacy of the method, and as a consequence it was decided to proceed with further installations where needed, doing the work in the track.

Description of Grinder

For making these installations, it was necessary to develop suitable equipment for grinding the grooves and for this work a Railway Track-Work P-16 grinder, with certain alterations, was used. The function of the standard model of this machine is the grinding of overflow metal from the side faces of switch points and stock rails. This grinder is mounted in a steel carriage having two double-flanged rollers arranged in tandem and a third roller placed at the end of a stabilizer arm extending to the other rail. It embodies a single-cylinder, four-horsepower, air-cooled engine connected by means of a V-belt drive to the spindle which is equipped with a double-cup grinding wheel, 10-in. in diameter, for grinding overflow metal. A push-handle is provided at one end of the frame for moving the unit during the grinding work, while a pair of handles of the wheel-barrow type are provided at the other end.

In the standard model, provision is made for lowering the grinding wheel to the depth desired by means of a double-grip handle fixed to the grinding head, while a handwheel placed at the right-hand side of the push-handle controls the lateral adjustment of the grinding wheel. To adapt this machine to the operation of grinding grooves in the rails for the copper strips, the cup wheel was replaced with a 10-in. by 5/32-in. by 1-in. slotting wheel and certain alterations were made in the feed control and guide mechanism.

To permit the necessary degree of precision in controlling the vertical movement of the wheel, a screw feed, embodying a handwheel control, is provided. This feed actuates the grinding wheel through the double-grip handle mentioned above, and the handwheel control is arranged on a cross bar of the push-handle where it is within convenient reach of the operator. To insure that the grinding wheel for grooving the rails will be in the proper lateral position relative to the head of the rail, the double-flanged rollers were shifted transversely the necessary distance and in making this change the attachment of the rollers was so arranged that they can be readily returned to the original position if it is desired to use the machine for grinding overflow metal.

Another alteration made in the grinder embodies the provision of a pair of horizontal guide rollers at each end of the carriage frame. The rollers in each of these guides bear against opposite sides of the rail head, and were provided to insure that the machine would be held to a true course during the grooving operation. Because there is no reason for changing the lateral position of the grinding wheel during the grinding of the grooves, the handwheel at the right-hand side of the push-handle is not used in this operation.

The Grinding Operation

In grinding the grooves for the copper strips, an average of about eight passes of the machine (using a 30-grit medium-hard wheel) is needed, although the actual number of passes required varies within rather wide limits, depending on the hardness of the rail. In fact, the experience has been that in a single rail length the hardness of the metal may vary to such an extent that certain portions may require a larger number of passes than others. In the operation of the grinder the operator places his right shoulder against the push-handle and keeps his right hand on the screw feed. In this position he pushes the machine slowly along the rail and by noting the resistance to movement, as measured by the pressure against his shoulder, he is able to gage the depth of the "bite" that can be made and to manipulate the feed accordingly. In cutting the grooves, the abrasive wheel roughens the sides of the cut or groove sufficiently to hold the copper strip in place after it has been driven home by a ball-peen hammer and by the wheel treads of equipment.

Inserting the Strip

In placing the copper strips, the object is to allow them to project slightly above the rail surface in order to permit them to be driven securely into the groove. For this reason the grooves are ground out to a depth of about 11/64 in., or 1/64 in. less than the thickness of the copper strip. A steel gage of the proper dimensions is used to check the depth of the groove. While the grinding wheel used is 1/32 in. less in thickness than that of the copper strips, the slight enlargement of the width of the groove that takes place as a result of successive passes of the grinding wheel is sufficient to permit the copper strips to be inserted.

After the groove has been ground to the proper depth, the copper strip is inserted and driven securely into the groove with a 2-lb. ball-peen hammer. The projecting portion of the strip is thus flattened out somewhat, and under the influence of moving equipment this flattening process is continued until in some cases the excess copper is rolled out over the rail surface in a thin sheet. Eventually, this sheet ordinarily peels off so that the copper strip presents a smooth surface, with clean-cut edges. In fact, so completely does the copper strip fill the groove that, after an installation has been in service for some time, a

(Continued on page 254)

Checking Depth of Groove with a Gage

Driving a Copper Strip into the Groove

M-K-T Improves Movable-Point Crossings

TROUBLED with more than ordinary maintenance of certain long, small-angle, movable-point crossings employing generally accepted standard features of construction, including standard brace-supported movable points, the Missouri-Kansas-Texas has incorporated improvements in these crossings which have eliminated many of the sources of trouble. Essentially, these improvements involve the more effective tying together of the entire crossing longitudinally by means of long "brace rails," which definitely fix the position of the point rails with respect to the stock rails and to each other.

One of the movable-point crossings of the road which required more than ordinary maintenance was that of its main line with the Missouri Pacific at Paola, Kan., a crossing involving an angle of 9 deg. 47 min. 30 sec., and operated as a part of a mechanical interlocking. This crossing was modified in 1936, in accordance with the improved features of design developed, with resulting marked improvement in conditions.

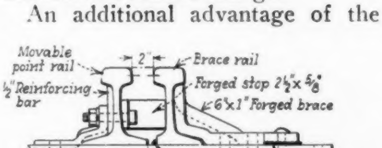
At the old crossing at Paola, in spite of generally favorable track and subgrade conditions, considerable difficulty was encountered in maintaining the proper relative position of the movable points and stock rails, as well as in maintaining the adjustment of the lock rods and interlocked operating connections to the movable center points. This difficulty was the result of the forces of expansion and contraction and rail creepage, in combination with a general looseness in the crossing which tended to cause excessive wear of the plates, braces, rails and points. Furthermore, as the movable center points worked against rail braces on individual ties, they developed an appreciable whip, causing excessive wear and tear.

Four Rail Braces Installed

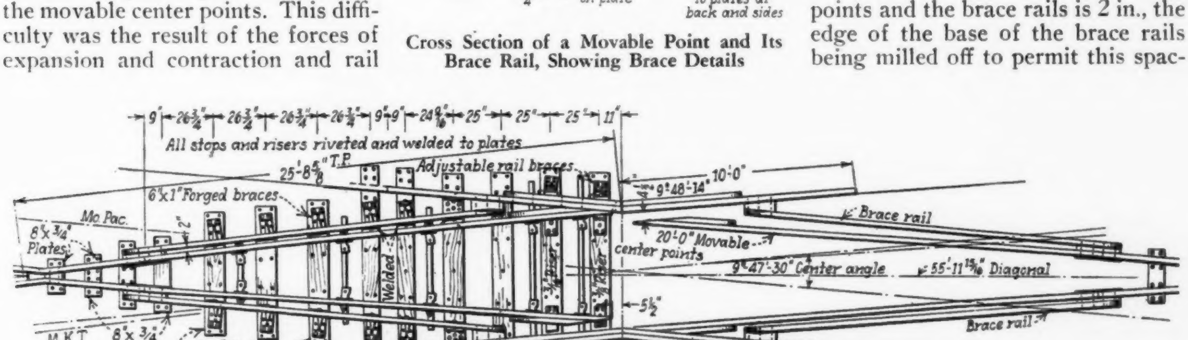
The outstanding feature of the improved design incorporated in this crossing is that the track layout as a whole is tied together as a fixed unit longitudinally, this being accomplished by the introduction of movable-point brace rails. Each of these brace rails, 18 ft. long, is bolted at one end to the joint in which the corresponding movable point is hinged, and at the other end through a filler block to the bent stock rail forming a part of the crossing. With four such brace rails, the crossing layout as a whole is a fixed unit, from the hinge joints at one end to the hinge joints at the other end. Therefore, the relative position of the points and the stock rails at the intersection cannot change.

An additional advantage of the improved design is that, when the points are lined up in position for a route to be used by a train, four metal stop blocks on each movable point bear against the side of the corresponding brace rail, thus transferring the thrust from the wheels of the train directly to the brace rail as a whole, rather than, as formerly, to individual braces on each tie. As a result of this change, the lateral stiffness of the crossing as a whole was greatly increased and vibration and wear were reduced. The spacing between the heads of the movable points and the brace rails is 2 in., the edge of the base of the brace rails being milled off to permit this spac-

View of the Brace-Supported Movable Point Crossing at Paola, Kan.



Cross Section of a Movable Point and Its Brace Rail, Showing Brace Details



Plan of Crossing Layout, Showing the Locations of the Special Brace Rails

Close-up of a Movable Point and Its Supporting Brace Rail

ing. At the ends of the brace rails the rail head is forged down in the form of a riser.

Longer Stock Rails

In incorporating these features in the crossing at Paola, the entire crossing was rebuilt, using, however, A.R.E.A. standards as the basic design. An important modification incorporated in the design is that the stock rails, bent to an angle of 9 deg. 46 min. 47 sec., were purposely made longer than usual, their total length being 20 ft. This extra length allowed space at each end for the bolts to be applied through the stock rail, the filler blocks and the ends of the special brace rails. An added advantage of using the longer stock rails is that joints were removed as far as practicable from the crossing. In order to reinforce each stock rail directly at the intersection, an added section of rail, 10 ft. long and bent to the proper angle, was welded to the outer side of the stock rail, the ends being forged down in the form of a riser.

The movable center points are 20 ft. long and are reinforced by means of ½ in. bars riveted to the gage side, and a feature in connection therewith is that the free end of each point is equipped with a roller bearing mounting, which acts to reduce the friction of operation on the slide plates. The second joint hole from the heel of each point was drilled to permit the use of a thimble over the bolt, thereby permitting free hinging of the point in the joint. The end of the point has a vertical bend for 5 ft. and the top is planed for a distance of 1 ft. 9 in. and chamfered for 6 in., starting with ⅛ in. and ending with ⅜ in.

The roller-bearing mounting of each movable point involves a roller mounted in a bracket bolted to the switch rail, which has support on a multiple-leaf cantilever spring secured to the stock rail. This anti-friction device, which was furnished by the Union Switch & Signal Company, provides for the support of approximately 80 per cent of the weight of the movable point on the roller bearing, while the point is being moved, lifting it just free of the slide plates. However, when a train travels over the point, it is supported by the slide plates in the usual manner. The use of this device has eliminated the necessity for frequent oiling of the slide plates, and, at the same time, has resulted in much more uniform power requirements for throwing the points than was the case when they were given support on the slide plates throughout their movement. The frogs of the crossing are unusually long, and thereby eliminated extra short sections of rail and joints between the frogs and the heels of the movable points.

Continuous 1-in. by 10-in. gage plates are used on the first four ties each side of the intersection, and 1¼-in. plates on the next two ties. Adjustable rail braces are used on the four ties directly beneath the intersection. The fixed rail braces, stops and risers are welded to the plates, in addition to being secured by the usual rivets. Furthermore, the brace rails are welded to the tie plates. The crossing was installed on new 8-in. by 12-in. sawed oak ties and was carefully surfaced on crushed stone ballast.

The results that have been secured with the improved crossing since its modification in 1936, are said to have been very satisfactory. The interlocking connections were given a final adjustment after the crossing was in service a short time, but no other special attention has been required, thus eliminating a former constant source of trouble and train delays. Furthermore, the crossing rides well, is safer for train operation than the crossing it replaced, and requires much less maintenance work on the part of the track and signal forces.

Second Installation

A latest installation of this character, involving brace rails, roller-bearing-mounted points and other comparable features, was completed recently at Sedalia, Mo., where the main line of the M-K-T again crosses the Missouri Pacific. Here, where the angle of crossing is 7 deg. 30 min., the details of design are similar to those employed in the Paola installation, except that, as permitted by the smaller angle of crossing, the brace rails are longer, giving maximum stiffness longitudinally to the crossing, and special recessed filler blocks were provided at the heels of the point rails in substitution for the thimble arrangement, insuring a freer hinging action at these points.

The redesign and building of the crossing at Paola, as well as the more recent installation at Sedalia, were carried out under the direction of F. Ringer, chief engineer of the Missouri-Kansas-Texas, assisted by R. C. Dunlay, district engineer and J. A. Johnson, superintendent of telegraph and signals.

Copper Strips in Rails

(Continued from page 252)

casual observer would not be likely to notice anything unusual about the surface of the rail.

The organization employed for placing the copper strips consists of the grinder operator, a signalman whose function is to insert the strips, and a watchman. The output of this organization is governed, of course, by the speed with which the grinding can be done. In an average 8-hr. day the grinder can groove 65 or 70 ft. of rail, although the actual output depends in large measure on the extent to which the work is interrupted by train movements. The amount of copper strip needed depends, of course, on the particular layout, but an indication of the quantities required is given by the fact that a total of about 800 ft. of strip was inserted in one No. 20 crossover.

In an effort to determine what type of grinding wheel is best suited to the class of work involved in grooving rails, experiments have been conducted with wheels of various degrees of fineness and hardness. To date, the best results have been obtained with a medium-hard 30-grit wheel. Wheels having these characteristics are capable of completing the grooving of 90 to 100 ft. of rail before they must be discarded because of wear.

The practice of inlaying copper strips in the running surfaces of rails, and the procedure involved, were developed on the Pennsylvania under the general supervision of Robert Faries, assistant chief engineer, maintenance, and J. G. Hartley, assistant engineer.

Drifting Caisson Causes Bridge Failure

AS A result of a bridge failure brought about by circumstance over which the railway had no control, a locomotive and one car of a passenger train on the Boston & Maine were precipitated into 60-ft. of water in the Piscataqua river at Portsmouth, N.H., on September 10, 1939, with the loss of two lives. The bridge in question is 1,650 ft. long and is composed of 1 draw span, 7 truss spans and trestle approaches at each end, the latter consisting of 151 pile bents and 84 stringer spans. The truss spans are numbered from the west end, and the accident occurred at Span 4.

This span was supported on three pile bents at each end, each of the pile groups containing 36 piles. Each of these piles was constructed of two 45-ft. oak timbers having minimum 18-in. butts and 12-in. tips, spliced at their butt ends to provide a pile of sufficient length and stiffness for the depth of water encountered at this point. The piles were driven to refusal and it is stated in the report of the Bureau of Safety of the Interstate Commerce Commission, from which this information is abstracted, that the penetration averaged 8 to 10 ft. The truss span involved was a Howe truss of the usual construction, having a span of 84 ft. The evidence indicated that the timber was generally sound, that there were no structural defects, and that the supports on the pile bents were adequate.

Building Bridge Nearby

On the upstream side of this bridge there was an abandoned highway bridge and at the time of the accident, a new two-level bridge was under construction on the south or downstream side, designed to carry trains on the lower level and highway and pedestrian traffic on the upper level. The new bridge is to be a steel superstructure supported on concrete piers and, in the immediate vicinity of the accident, the center line is 60 ft. downstream from the center line of the railway bridge. Caissons were being used for the construction of the piers for this bridge, and the caisson for Pier 17 had been placed in position and anchored on August 29. This caisson was 30 ft. by 72 ft. in plan and extended 76 ft. above the cutting edge. It had been partly filled with concrete at the time of the accident and weighed approximately 4,200 tons. It had not yet been landed, although the contractor testified that at low tide it was on the bottom with the cutting edges probably not penetrating the stream bed more than a few inches, while at high tide it was afloat.

The caisson had been secured in position by means of 50-ton concrete anchors. The cables leading from the upstream corners passed under Span 4 to anchors on the upstream side of the railway bridge, while other anchors were placed downstream. Breast anchors were also provided on each side of the caisson and as an additional precaution a cable was extended from the two westerly corners around Pier 16 which had been completed. All of the attachments for these cables, which were of 1⅛-in. and 1¼-in. plow-steel, were made at points about 46 ft. above the cutting edge. The average tide at the bridge is from 8 to 10 ft., and runs at about 5 miles an hour. There had been intermittent squalls of rain prior to the accident and at the time that it occurred, at 7:10 p.m., there was a strong wind and it was cloudy.

No. 2020, the train involved in the accident, was a westbound passenger train consisting of a locomotive, three coaches and one combination baggage and smoking car, in the order named. The locomotive, tender and first car dropped into the river and were submerged to a depth of about 60 ft. The locomotive was found on its left side with its front end close to the piles that supported the west end of the span, and with its rear end extending diagonally upstream. The tender, also on its left side, was practically in line with the locomotive. The passenger car was upright practically parallel with the stream, but with its nearest end about 100 ft. upstream from the bridge.

Bent Pulled Out of Position

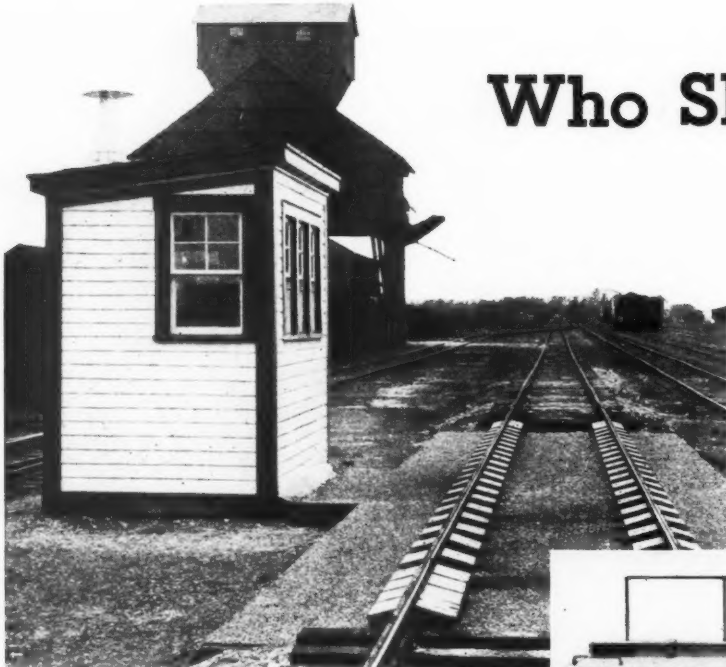
Testimony adduced at the investigation, indicated that the caisson for Pier 17 had shifted 80 ft. to a point near the eastern shore of the river. After the accident, it was found that the downstream end of the three bents supporting the east end of Span 4 had been shifted to the east 18 ft., and divers found two sets of cables pulled so tightly across the bent that they were embedded ¾ in. in the piles. These cables were traced from the northeast and northwest corners, respectively, of the caisson to the upstream anchors.

In its discussion of the testimony, the Bureau said in part that "After the accident it was found that Caisson 17, located downstream from the railway bridge and weighing approximately 4,200 tons, had drifted eastward 88 ft., and that the cables leading from the caisson to its upstream anchors had fouled the piles of Bent 27, finally pulling that bent, together with bents 27½ and 28, eastward 18 ft. at the downstream end; no material bending took place at the upstream end of these bents. Examination of the downstream truss after its recovery from the water did not indicate that it failed because of structural weakness of any kind.

"On the night of the accident there was a 30-mile-an-hour wind and the incoming tide was unusually swift and high, running across the stream to the Kittery (east) shore. The area of the side of the caisson, facing the direction from which the tide was flowing, was about 5,472 sq. ft.; the tide exerted its force against the part that was submerged, which was the greater part of the area. Cable 6, leading to the upstream west anchor, afforded no protection against this cross-stream current, because of the angle at which it was anchored on account of interference of the piles in the railway bridge, and the holding power in that direction was in the downstream west anchors, the cables around Pier 16 and the west breast anchor.

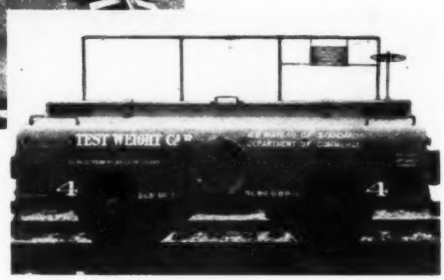
"It is believed that the weather and the tide prevailing at the time caused Caisson 17 to drift, placing a heavy strain on cables 7, 8 and 9 (cables 7 and 9 passed around Pier 16 and Cable 8 led to the west breast anchor) and that cables 7 and 9 broke, shifting the strain to Cable 1 (the downstream west anchor consisting of two 50-ton concrete blocks); then the connection to one of the 50-ton anchors snapped off, and Caisson 17 drifted eastward, dragging the other 50-ton anchor and the breast anchor. Caisson 17 continued to drift until it became grounded after the upstream cables had caused sufficient damage to the bridge to permit truss span No. 4 to be unsupported at the downstream corner, and the span collapsed when the weight of the engine hauling No. 2020 was placed upon it."

The Bureau concluded that the accident was caused by the collapse of the truss span as a result of the pile bents supporting its east end having been pulled out of position by the drifting of the caisson, resulting in the fouling of the bents by anchor cables attached to the caisson.



Who Should Inspect Scales?*

By E. C. JACKSON
Supervisor of Maintenance of Way Equipment and Scales, Southern Pacific, Houston, Tex.



A Well-Designed, Well-Maintained and Properly Calibrated Scale Test Car Is Essential to the Testing and Maintenance of Track Scales

SEVERAL types of scales are in use on the railways, including the track, vehicle, platform and portable types, all of which should be inspected regularly to insure that they are being maintained in good physical condition and that they are weighing accurately. This latter assurance cannot be obtained, however, without a thorough job of scale testing. For this reason, scale inspection should always be understood to include scale testing. Scale inspection, scale testing and scale maintenance require not only expert knowledge of scale construction, but mechanical ability and experience in this class of work.

Needs Scale Test Car

If one is to inspect and test track scales properly, he should have a well-designed, well-maintained and properly calibrated scale-test car. This equipment should have a gross weight of either 40,000, 80,000 or 100,000 lb. It should be mounted on four wheels with roller axle bearings. The body should be in one piece, of either steel or cast iron, with a calibrating weight space under a plate-steel running board. There should also be a super-cargo cavity running transversely through the center of the body for necessary tools and like materials.

Rolled or forged steel wheels are used on these cars, and it is recommended that the wheel base shall not exceed 7 ft. Since the car must be handled in freight trains, the draft gear should be of the friction type and of a design that can be maintained easily. The weight of the car should be calibrated frequently on a master track scale where such a scale is available. If a master scale is not available for this purpose, the test car should be compared by substitution with the scale-testing equipment of the United States Bureau of Standards on each trip that this equipment makes over the road, using the most accurate track scale available.

There are several methods of spotting test cars on track scales. To secure information as to the accuracy of the scale, we prefer the so-called Bureau-of-Standards' method, which has been adopted generally by the Western lines. In this method, the test car is first placed to the right or left of one end section, with the center of the outside axle directly over the center of the end section. A reading of the scale beam is then taken after first balancing the beam. The car is then moved so that the center of the front axle is over the center of the next section, and a reading is taken again. The car is then moved a distance equal to the full wheel base, so that the other axle is spotted centrally, and this procedure is continued to the end of the scale, readings being taken each time the car is spotted. The second of the two methods used most commonly is to spot the test car centrally over the intermediate sections and as described over the end sections.

When testing two-section track scales, the car is usually spotted at each end and then one reading is taken with the car spotted centrally over the midpoint of the scale platform. This procedure is varied sometimes, however, to secure two readings, spotting the forward axle over the central point of the platform and then moving the car one wheel-base length ahead. It is generally advisable to repeat these tests in reverse order to check the readings first taken, and this should be done on all scales. Immediately following these tests the actual inspection of the scale should be made.

Inspection Form Is Required

A well-detailed scale-test and inspection form should be used to record all details that are observed as the inspection progresses. To insure an accurate report, the original notes should be made on the form. To insure ac-

*This discussion was submitted for publication in *What's the Answer* department in answer to a question as to who should inspect scales and what details should be given attention during the inspection. Because of its comprehensive character, it was withheld for publication here as an independent article. For a further discussion of the subject, see page 99 of the February issue.

curacy, notes should never be made and then transcribed on the form by the inspector. If it becomes necessary to transcribe the record for the purpose of forwarding one or more copies, the regular form should be used for making the transcription, and this should be made from the original report, filing the original with the transcribed copy. One is likely to find at times that the original report is very important.

When engaged in the inspection, the inspector should examine every part of the scale carefully, always starting at the same point. We suggest that this be the scale beam, followed in succession by the shelf lever, if there is one, then the fifth or transverse lever and so on throughout. As he progresses he should inspect all associated parts, making his record as each part is observed. The inspection will not be complete unless the inspector observes the condition of the scale pivots and bearings.

If the scale is new, or nearly so, the pivots and bearings should be in good condition, for a modern track scale that has been installed properly and is being well maintained will show little evidence of wear for a long time. On the other hand, it is desirable to raise the scale levers off of the bearings periodically, and to clean off the grease preservative, making a very careful observation and record of each pivot knife edge and bearing. Scales of the plate-fulcrum type need not be disturbed for such an inspection. If any of the parts need renewal this can be taken care of by either replacing the part or removing it and having it reconditioned, preferably at the shop.

When the Scale Gets Old

As the scale increases in age, wear will become more evident and more care will be required in both inspection and tests. Eventually, it will be necessary to take the scale out for a complete overhauling. At this time the repairs should be of such a character that when finished the scale will be equal to a new one; that is, unless it is of a capacity and design that are becoming obsolete and are scheduled for retirement in the near future.

If defects that can be remedied in the field are discovered, they should be repaired at once if the time available will permit. However, if they affect the accuracy of the scale, they should be taken care of immediately or as soon as the labor and material can be assembled. If the work consists of adjustments, such as the leveling of parts, the restoration of vertical parts or assemblies to plumb, the recentering of pivot knife edges in their bearings or the tightening of loose parts, it should be done without delay. Following any such adjustment, the test should be repeated in the manner described, that is, in the regular order and repeated in the reverse order. If the scale was outside the recognized tolerance, either initially or subsequently, yet is in good physical condition, with no binding of the track rails or of the rail chairs against the scale deck, and there are no dirt guards alongside the live rail, leverage-ratio adjustments may be in order.

A scale inspetcor should have a thorough knowledge of all things associated with scales; that is, he should not only be fully acquainted with the construction of the scale, but he should know the significance of scale-test results and he should have good mechanical sense and be unusually observant. One should never adjust a lever ratio when the fault lies somewhere else. Having these characteristics, experience is best teacher, and a good scale inspector knows almost intuitively when it is time to make lever adjustments. Not the least important requirement is cleanliness, for a good scale inspector is usually recognized by his good housekeeping.

Among other items, the inspector should note the condition of the running or live rails, paying particular attention to whether they are loose or well fastened to the deck; of the joints, whether they are welded or bolted and, if the latter, whether the bolts are tight; and of the gap between the live and approach rails, and whether there is sufficient clearance, but not too much, to prevent binding. This part of the investigation should include the adequacy of the rail anchorage on both the scale and the approaches. Good anchorage will prevent rail creepage and thus eliminate one fertile source of trouble. Another important item is to see that corrosion-preventive grease is being well maintained on pivots and bearings. If not, a new application should be made.

Testing Other Scales

Motor-truck, freight-house, baggage-room and other scales should be tested and inspected in a manner somewhat similar to track scales, using the scale-test weights carried in the scale-test car, instead of the car itself, for determining the acuracy of the scales. The first test should be made by loading successively each corner of the scale platform up to one-fourth of the scale capacity with 50-lb. test weights. On the smaller scales the four corners should be loaded simultaneously after the individual-corner test has been completed. Vehicle scales will require a large number of weights for these tests.

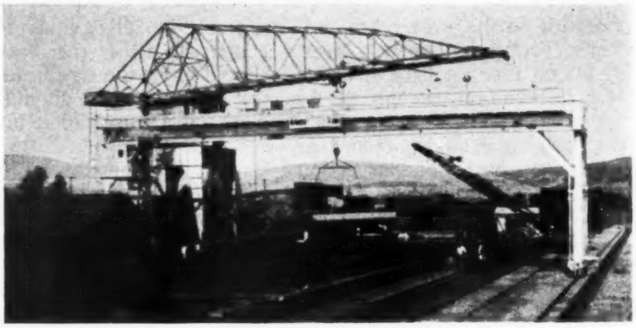
As before, the actual inspection should follow the test and should be made as carefully as for the track scales. Minor repairs and adjustments should be made when indicated, and the scale should then be retested. Since the tolerance limits for these scales are much closer than for the larger-capacity track scales, it follows that the workmanship must be correspondingly better and that the testing be done more carefully. No scale inspection can be too thorough, particularly if the scale is old, for the older scales are more difficult to maintain within the tolerance limit.

A report form covering all essential details should be provided for recording and reporting the findings of the inspection and, as has been emphasized in the case of track scales, the form should be filled out as the inspection progresses, with the same necessity for making the original report a part of the permanent record. Both as a means of identification and to simplify the record, all scales should be numbered and reported by number as well as by location. The reports can thus be filed serially by scale number and, if the system of numbering will permit, by station and district grouping. As a means of identification, the numbering of fixed scales is less important than for portable scales that may be moved from place to place, as is done so frequently.

How often should a scale be tested? This is a question that arises frequently and to which there is no categorial answer. The frequency with which a scale should be tested depends on many things. It is desirable, however, that a track scale be tested at least two to four times a year, with this interval shortened in many instances. The same general rule will govern motor-truck and wagon scales. Smaller scales in freight houses and baggage rooms may need to be inspected, cleaned and tested every 30 days, particularly if they are equipped with one of the so-called automatic weighing attachments. Generally, small scales of the portable type will give reasonably satisfactory service if they are tested once or twice a year.

When there are sufficient scales in use to warrant, a scale-repair shop should be established. In fact, such a shop is a necessity if the scales are to be maintained to a dependable standard. Scale maintenance requires special materials and some special tools, as well as a personnel that is specially trained in this class of work, for which reason it cannot be done to advantage in a general shop. If the latter is attempted it is quite likely that, in general, the scales will be allowed to become unserviceable before an effort is made to repair or replace them.

Two Views of the Well-Laid-Out Timber Framing Yard of the Union Pacific at The Dalles, Ore., Which Is Similar to a Second Such Yard at Laramie, Wyo.



The author of this paper makes it clear that the preframing of timber for bridges has not only proved itself practicable and economical on the Union Pacific, but also that the bridge and building forces of this road are now "sold" on this method of construction

Can Timber Be Preframed For Bridges?*

By G. H. TROUT

Bridge Engineer, Union Pacific System, Omaha, Neb.

FOR ages, timber has been framed for use in bridges and other structures, but it was not until the employment of treated timber in structures became general that "preframing" assumed significance and demanded the study of methods for its practical application. Not only was this demand logical because of the higher cost of treated material, but also because it soon became evident that the framing of timber after treatment often defeated the very purpose that the treatment was designed to accomplish, namely, longer service life than untreated timber.

Early Experience

Prior to our adoption of the practice of preframing treated timber, a number of treated wood box culverts had been installed on our lines without being preframed. The treated material for these boxes was cut to size and was erected at the site. Many of the culverts so constructed began to fail in 12 to 15 years due to decay in the exposed untreated ends of the timber, despite the fact that the cut surfaces had received an application of hot creosote after being framed.

At the time the preframing of treated timber for new bridge construction was first introduced and discussed among the officers and foremen in the maintenance of way and engineering departments on our lines, it met with considerable opposition. It was said to be impractical, if not impossible, to preframe completely and erect long pile trestle bridges. It was further contended that the piling in bents could not be driven sufficiently accurately as to location, and thus would make it necessary to await the outcome of the pile driving before the timbers for the deck could be framed to fit the pile bents.

To test the validity of this contention, and to overcome opposition to preframing, we assigned men trained in erecting materials which were manufactured and marked in shops and shipped to the site knocked down. The result was highly satisfactory from the standpoint that we found that such work could be done without difficulty. Our bridge and building forces fell into line and are now enthusiastic over this method of construction.

Conditions sometimes arise where a new structure is replacing a pile trestle that has, over a period of many years, been replaced in kind several times and the old pile stubs are so thick that it is difficult to redrive on fixed lengths of spans without some variation. Where such conditions exist, we drive the piles first and then take the necessary field measurements for preframing.

There are two timber treating plants

*Abstracted from a paper presented before the annual convention of the American Wood-Preservers' Association at St. Louis, Mo., on January 24.

on the Union Pacific at which the preframing and treating of timbers is performed; to each of these a certain territory is allotted. These plants are located at The Dalles, Ore., and Laramie, Wyo.

Collecting the Data

Following our annual bridge inspection, detailed timber lists are prepared, on which are shown the location and number of each structure, the number and size of timbers required, and also whether the timber is to be untreated, treated or preframed and treated. From these lists the purchase lists for timber are made up, and the timber is shipped to the particular treating plant in whose territory the structure is located. From so-called bridge repair and renewal schedules for the ensuing year a program is worked out, scheduling the work to be done from month to month. Detail drawings are made, in accordance with previous surveys, for the preframing and marking of each timber in the structure.

In order to facilitate obtaining the field data for the preparation of preframing drawings, special forms have been prepared for use in connection with the various types of structures. For new pile or frame trestles, field measurements are not required, the preframing being done from our common standard plans.

To permit the preframing of decks for steel bridges, field information is obtained as follows: For beam and deck plate girder spans, levels are run over the top flanges of the beams or girders, elevations being taken every 10 ft. and at the ends of cover plates if any. Transverse measurements, center to center of girders, with reference to the center line of track are also taken at the same points.

For through plate girder and truss spans, elevations and transverse measurements are taken at the tops of stringers on each side of the floor beams and at intermediate points as required to give an accurate profile and alinement of the tie-bearing flanges. Considerable more detail is required in the preparation of preframing plans for the decks for steel bridges than for pile and frame trestles because of the variation in elevation of the tops of the steel stringers.

Field data on existing pile and frame trestles consist only of measuring the span lengths, these measurements being taken center to center of bents along the outside face of the stringer chords. No elevations on trestles are required except in case the structure is a frame trestle on masonry piers or pedestals, as ties are sized to a uniform depth and caps and stringers are dapped to a constant depth at bearing points.

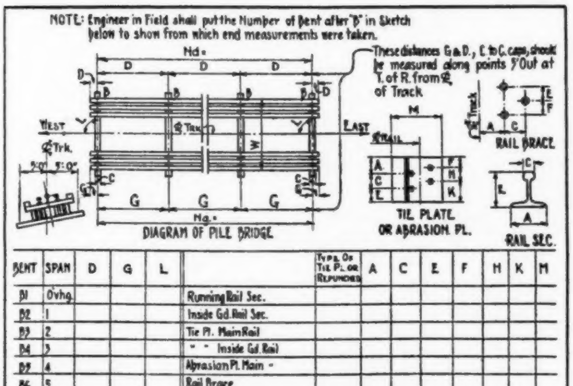
On the preframing diagram prepared there is a detailed sketch of every type of piece to be preframed, showing the sizes and locations of all holes to be bored and of all daps to be made. On this plan is also shown a marking diagram of all pieces to be preframed and treated.

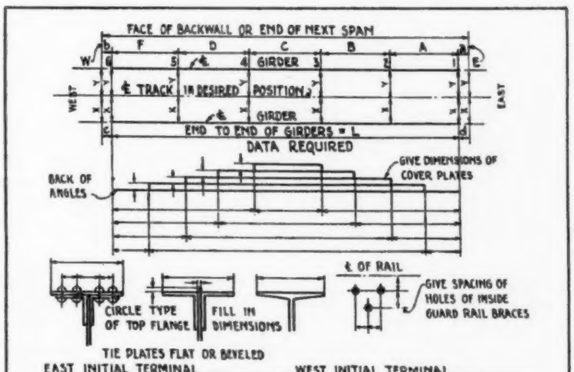
In the Framing Yard

Our framing yard at The Dalles, which is similar to the one at Laramie, is laid out to handle about 400,000 ft. b.m. of framed lumber per month. When we add to this the material that is incised only, the total amount of lumber going through the framing yard may reach 600,00 ft. b.m. a month.

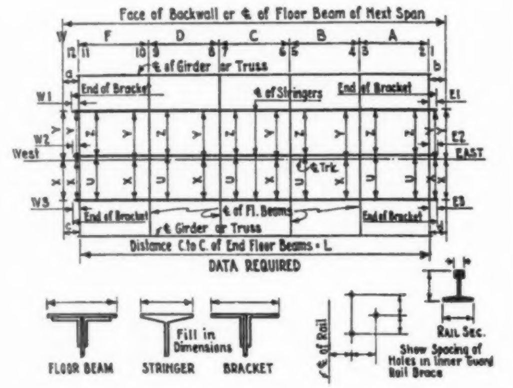
The area of this yard is approximately 55 ft. by 880 ft. Over it operates a 5-ton Whiting gantry crane with a span of 90 ft. and a clear height of 25 ft. beneath the girders. A standard gage and a narrow gage track are also spanned by this crane so that material can be loaded to and from cars or trams, or moved about the framing yard as occasion demands. In addition to being served by the gantry, the yard is served also by a hammer-head crane operating on a track along one side, to supply material from the storage yard as needed.

Included in the framing yard area are planer and incisor houses, a bandsaw house and two small buildings housing machines equipped with universal heads for cross cutting at any angle, dapping and ripping. Small





Forms Such as Those Shown Above Facilitate Obtaining the Field Data for the Preparation of Preframing Drawings



East Initial Terminal________ West Initial Terminal________
Alignment of Track________ Weight & Type of Running Rail________
" " " Inside Gd. " ________
Size of Ties on Span________ Size of Ties on Backwall________
Note: If Span is for Double Track Use 2 Sheets Marking one E.B. Track and other W.B. Track.
Note: Show Dimensions X-Y-U & Z at all numbered points that is on both backwalls and both sides of all Floor Beams and give elevations at these same Points. Assume an Elevation of 10.00 for Top of Rail at Point 1 No. Rail.
Tie Plates Flat or Beveled

COMPLETE TIE & GUARD TIMBER RENEWAL - T.P.G. & TRUSS SPANS
DISTRICT________ DIVISION________ BRANCH________
BRIDGE No.________ E.B. OR W.B. TRACK________
SPAN No.________ (From E. end of Bridge) Date________

POINT	X	Y	U	Z	ELEVATION TOP OF					FILL IN DIMENSIONS BELOW
					So. Str. or Bk. Wall	South Rail	Center Stringer	No. Strg. or Bk. Wall	North Rail	
E										Panel Length
1										A
2										B
3										C
4										D
5										F
6										G
7										H
8										K
9										M
10										N
11										O
12										P
13										Q
14										R
15										S
16										T
17										
18										
19										
20										a
21										b
22										c
23										d
24										L
25										E1
26										E2
27										E3
28										W1
29										W2
30										W3
31										
32										
W										

COMPLETE TIE & GUARD TIMBER RENEWAL - T.P.G. & TRUSS SPANS
DISTRICT________ DIVISION________ BRANCH________
BRIDGE No.________ E.B. or W.B. TRACK________
SPAN No.________ (FROM END TO END OF BRIDGE) DATE________

Pages One and Two of the Form Used in Recording Field Measurements for the Renewal of Ties and Guard Timbers of Through Plate Girder and Truss Spans

portable tools include Wolf saws, Speedmatic saws and power augers. All machinery and tools are operated by electric power. All buildings and machines are so located throughout the yard area as to avoid congestion of work and back-haul of material.

The area available for assemblies and other framing work is further reduced by a line of 16 in. dead rolls, spaced 36 in. on centers and extending along the full length of one side of the yard, feeding to and from the cut-off saws. In the balance of the yard, permanent skids are provided, composed of railroad rails on blocking. These rails are laid transversely and are spaced 8 ft. between centers longitudinally with the yard. Their tops are only about 18 in. above the ground, which permits easy movement of the men through the yard and at the same time places the material at a convenient height for the workmen.

The methods used in framing have been developed largely at the plant but probably are not much different from those used elsewhere. Most of our structures differ in major dimensions from all others of the same type so that it has not been found practicable to use standard templets for anything except bridge ties. There are a few notable exceptions to this, however, one of which is worthy of mention.

In 1937 we built a timber dam near Sun Valley Lodge in Idaho. This dam is 385 ft. 5 in. long, with a maximum height of about 20 ft., and consists of an inclined deck supported by 65 bents spaced on 6 ft. centers, all on suitable concrete piers. The materials for this dam, including bents, girts, joists, bridging, spillway crest and apron supports were preframed and treated and were assembled in the field without any additional framing.

The bents, owing to their similarity, were divided into seven different types, according to height. The first bent built of each type was made from templates and assembled to check its accuracy; then each following bent of the same type was made from these templates and was not assembled until its final erection on the job.

Framed bents in our railroad trestles vary so much in height that templates have not been found satisfactory for them. Each bent is detailed separately. The parts are cut by power saws and the bent is assembled to check its height, at which time the boring is done.

We have found it advantageous in some cases when preframing certain parts of wood structures, such as the stringer chords of a trestle on a curve, to assemble the parts completely before preframing. The individual pieces in a chord are cut to length in accordance with the detail drawing, and are then assembled on the alinement that the chord will finally take in the finished trestle before the packing bolt holes are bored. This insures complete success in erection. We have erected many pile trestles, one consisting of 109 spans, with completely preframed and treated decks without making any cuts or boring a single hole in the field.

The Working Schedule

About 60 days prior to the time that a preframed treated timber job is scheduled for construction, the treating plant receives the detailed preframing drawings. The various timbers required for the job are then deposited on the receiving end of the skidway, where they are cut to proper length. Each timber is stamp marked with the bridge number at one end, and with a number designating its location in the structure at the other end, as shown on the detailed preframing drawing. Bevel ties for use on steel bridges on curved track are taken to the bandsaw and are ripped to conform to the prescribed super-elevation. Timber stringers are bored for chord bolts and anchor bolts, and are also dapped at the bearing points. All ties for steel bridges are dapped to fit the steel stringers or girders on which they are to rest.

The boring of ties for track spikes for running rails, as well as inside

guard rails, if any, for use on tangent track on steel bridges for trestles, is generally done in accordance with a standard template. On bevel ties used on steel bridges on curves, each spike hole is located precisely in accordance with detail drawings, and is bored at right angles with the bevel surface of the tie. Track spike holes are bored to ⅜ in. diameter and the full depth of the tie. Holes in guard rail timbers for boat spikes are bored to ½ in. diameter.

Owing to the length of the framing skidway, our framing forces can generally lay out and frame complete bridge decks for bridges of great lengths at one setting, which enables them to check the work closely for errors, whether made in the survey, drawings or framing, so that, after the timbers are fed through the incisor and sent on their way to the treating retorts, an accurate job is reasonably assured. The numbering and marking of timbers are done by hand, using semi-circular markers fashioned from simple 1-in. pipe ends one foot in length, a dull straight cold cut and a hammer, it being well known that all letters and numerals can be made from these simple outlines.

Costs

Accurate data collected on the actual performance of the work of preframing timbers for use in bridges have established the following figures, which vary only slightly:

The preframing of complete tie and timber guard rail renewals for trestle bridges requires 1/3 man-hour per foot of bridge.

The preframing of timbers for a ballast-deck trestle bridge requires 1½ man-hours per foot of bridge.

The preframing of timbers for the complete deck renewal of trestle bridges, which includes stringers, ties and guard rail timbers, requires 1 man-hour per foot of bridge.

The preframing for complete tie and guard rail timber renewal for steel bridges on tangent track requires 1 to 1½ man-hours for each tie used on the bridge, according to the size of ties required.

The preframing for complete tie and guard rail timber renewal for steel bridges on curved track requires about 1½ times that required for timbers on tangent track bridges.

The average cost of obtaining the field data per 1,000 ft. b.m. of timber preframed is—for complete decks of trestles—$0.35; for decks of steel bridges—$3.95.

The average cost per 1,000 ft. b.m. for preparing the plans is—for complete decks for trestles $0.35; for decks of short I-beam spans, $3.50; for decks of girder spans less than 100 ft. in length, $1.00; and for decks of girder or truss spans more than 100 ft. in length, $0.90.

From the above it is obvious that the cost of obtaining the field information and preparing the preframing plans is more than offset by the saving which is gained because of the additional service life of the timber.

P.R.R. Commends Supervisors

IN accordance with the usual custom on the Pennsylvania, recognition was extended to the track supervisors on the road having the best maintained districts on the different divisions in 1939 by letters of commendation sent by their superior officers. As a basis for such recognition, periodical track inspections were conducted throughout the year by special committees which were headed by the chief engineer maintenance of way of each region.

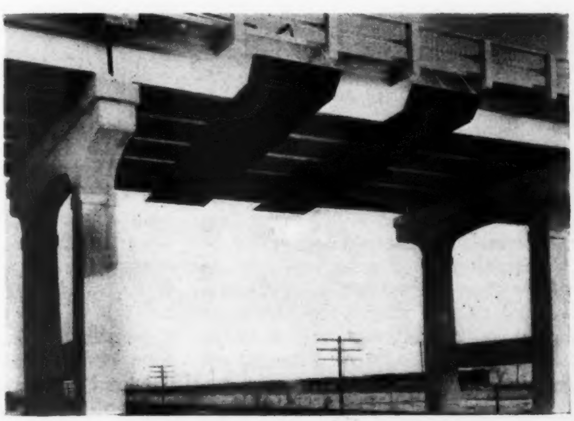
Likewise, the track foreman of each supervisor's subdivision whose territory was given the highest rating for that subdivision received a letter of commendation from his superintendent. The names of the track supervisors and their assistants (where they have assistants) who received commendatory letters, together with their headquarters, are given below:

New York Zone—New York division—M. S. Smith, New York, N.Y.; N. L. Fleckenstine (assistant). Long Island railroad—Lee Spencer, Jamaica, L.I.

Eastern Region—Maryland division, main line—E. E. Kinzel, Washington, D.C.; J. W. Buford (assistant). Maryland division, branch line—E. G. Adams, York, Pa. Middle division, main line—W. C. Gretzinger, Newport, Pa.; W. B. Blix (assistant). Middle division, branch line—D. M. Howard, Hollidaysburg, Pa. Philadelphia to Harrisburg, main line (Philadelphia division)—E. R. Shultz, Lancaster, Pa.; C. F. Parvin (assistant). Philadelphia division, branch line—N. V. Hunter, Earnest, Pa.; Philadelphia Terminal division—T. E. Boyle, Philadelphia, Pa.; J. M. Minturn, Jr. (assistant). Delmarva division—L. H. Miller, Harrington, Del. Williamsport division—J. C. Warren, Northumberland, Pa. Wilkes-Barre division—R. S. Dunkle, Sunbury, Pa.

Central Region—entire region—A. H. Stimson, Pittsburgh division, main line, Derry, Pa. Eastern division, main line—C. P. Sipe, Pittsburgh, Pa. Panhandle division, main line—J. P. McGhee, Newcomerstown, Ohio. Panhandle division, branch line—A. M. Kennedy, Jr., Benwood, W. Va. Pittsburgh division, branch line—M. J. Miller, Barnesboro, Pa. Conemaugh division, branch line—W. J. Gilbert, New Kensington, Pa. Monongahela division, branch line—R. G. Davis, Shire Oakes, Pa. Buffalo division, branch line—G. D. Markert, Buffalo, N.Y. Renovo division, branch line—W. G. Pfohl, Kane, Pa. Cleveland division, branch line—Jos. Conlon, Alliance, O. Erie & Ashtabula division, branch line—E. W. McGarvey, Sharon, Pa.

Western Region—Chicago Terminal division—H. W. Manning, Colehour, Ind. Fort Wayne division—C. Weiss, Valparaiso, Ind. Logansport division—John Nowviskie, Crown Point, Ind. Toledo division—Darel DeVore, Marion, O. Grand Rapids division—H. B. Sutherlin, Grand Rapids, Mich. St. Louis division—W. P. Conklin, Terre Haute, Ind. Indianapolis division—J. H. Ault, Jeffersonville, Ind. Columbus division—L. F. Beard, Columbus, Ohio. Cincinnati division—Paul Reeves, Anderson, Ind.



An Overhead Highway Bridge in Texas Equipped with Blast Plates of Mayari R, High-Strength, Corrosion-Resisting Steel

Motor Car Causes Passenger Train Derailment

A TRACK motor car was demolished, a passenger locomotive was turned over on its side down a six-foot embankment, the locomtive and tender were badly damaged, six cars were derailed, and the engineman was killed and eight persons were injured on the Chicago & North Western near Great Lakes, Ill., on November 22, 1939, as the result of a track motor car fouling a main track on the time of a first-class train.

This accident occurred between Chicago and Waukegan, Ill. At Great Lakes station, where the initial derailment occurred, the two main tracks are separated by a station fence and there are two station platforms, one on each side of the double-track line, connected at the west end by a planked crossing. Approaching from the east there are, successively, a tangent 9,600 ft. in length extending to the point of accident, a one-degree curve to the right 2,233 ft. in length, and a tangent approximately 600 ft. in length to the final point of derailment at a trailing point crossover switch.

In the report of the accident, made by the Bureau of Safety of the Interstate Commerce Commission, from which this information is abstracted, it was stated that an assistant bridge and building gang foreman and three carpenters were sent by the bridge and building gang foreman from Waukegan, Ill., to Great Lakes via motor car to repair the inter-track fence at Great Lakes.

The gang arrived at Great Lakes about 8:30 a. m., set its motor car off the track in the clear and proceeded with its work. When the work was completed about 3:30 p.m., the assistant foreman looked at his watch and remarked that No. 401 was late and that No. 365, the train that closely follows No. 401, would probably also be late. After consulting his timetable he estimated that after these trains had passed he would have 50 min. to go to Waukegan, a distance of 3.73 miles, overlooking train No. 209, which is scheduled to arrive at Waukegan at 4:07 p.m.

The gang waited for No. 401 and No. 365 to pass, placed the motor car on the westbound main, and, in order to start the motor, pushed the car on the track about 120 ft., when one of the men looked back and saw an approaching train coming around a curve about two miles distant. The assistant foreman instantly realized that it was No. 209. The men pushed the car back to the plank crossing at the station, where they had put the car on the track, as sufficient time remained to remove it from the track. At the crossing two men rode the head end of the motor car to balance it as the other two men lifted the rear end and swung it around, setting it down at about a 45 deg. angle with the track. Then as they started to push it off the track, a wheel dropped off the planking and the men were unable to move the car. In this position the rear wheels of the car were outside of the south rail of the track and the front wheels were in the center of the track. At that time the train was approximately 1,000 ft. distant. The assistant foreman then ran toward the train on the fireman's side of the track giving stop signals with his arms. He heard no whistle and said that the train was working steam when it passed him and that he did not think the brakes had been applied.

At the time of the collision the speed of the train was variously estimated as from 60 to 90 m.p.h. The motor car, which had a steel frame and weighed 1,035 lb., was demolished and thrown to the south of the track. Marks on the track indicated that a pair of engine truck wheels was derailed just west of the point of collision by some part of the wreckage. These marks continued 2,895 ft. to the frog of a trailing point cross-over where the final derailment occurred. The weather was clear at the time of the accident, which occurred at 4:06 p.m.

In the investigation the testimony of the members of the bridge and building gang brought out the fact that the assistant foreman, although he had only a verbal line up, had overlooked the time of a scheduled first-class train. In addition, one of the carpenters in the gang testified that while pushing the car back towards the crossing, he requested the assistant foreman to hand him a fusee, which he could not reach from his side of the car, but that his request was disregarded. It was further brought out that the assistant foreman did not have a standard watch, although he said that he had a watch that kept accurate time and that he did not think he was required to carry a standard watch. Other testimony brought out the fact that, although he had worked in that territory as an assistant foreman for more than two years, he had not been examined on the rules to determine his qualifications for operating a motor car and was unable to state the authorized speed of motor cars.

Rules 703 and 713 of the Rules Governing Maintenance of Way and Structures Employees read as follows:

703. No one except a responsible employee who has been properly qualified will be allowed to operate track cars upon the main track.

713. Employees operating track cars on main tracks shall, when practicable, obtain information regarding trains, but such information will not relieve them of the responsibility of protecting the cars. They must see that the cars are clear of the track for trains.

The foreman of the bridge and building gang stated that although he had not examined the assistant foreman on the rules to determine his qualifications for operating a motor car on the main line, he considered him qualified because of the manner in which he did his work, the manner in which he operated a motor car and his knowledge of the timetable.

The supervisor of bridges and buildings in charge in that territory stated that from time to time copies of circulars issued by the engineer of maintenance relative to the safe operation of track motor cars are furnished to all foremen and that on Monday mornings each crew is required to hold a "safety meeting," at which meetings accidents and their causes are discussed and preventative suggestions are offered. He added that he attends these meetings whenever possible and discusses such matters with the men.

A Long Freight on the D. & R. G. W. "Blasting" Her Way Up a Three Per Cent Grade Through Tennessee Pass at Mitchell, Colorado.

Keeping Personal Injuries Down

What precautions should be observed to avoid personal injuries when distributing material for rail renewals?

Suggests Material Yard

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

Rail for renewal is usually distributed by work train, and the men required to be on these trains should place themselves where they will not be exposed to danger. Defective or inadequate equipment, inefficient motive power, incompetent train or enginemen should not be allowed to go out with work trains, because they are all potential sources of personal injuries. When unloading cars, care should be exercised to keep them balanced, since too much load on one side may turn them over. Rails should not be unloaded while the train is in motion, unless the unloading devices are designed for doing this.

Cars of rail that have not been stripped for quick and safe application of the tongs should be unloaded by magnet cranes in material yards and reloaded properly for going out on work trains. Shifting and digging out rails on a work train are likely to cause bad personal injuries. This brings up the question of central material yards, under proper supervision, for assembling materials for rail renewals. These materials will arrive in revenue cars but not on the exact day needed. A locomotive crane, equipped with a magnet, will release these revenue cars quickly and assemble the various classes of material for loading as wanted, and materials that need housing can be put under cover. There is little chance of personal injuries in a well-regulated material yard.

When the rail renewals are to begin, the rail and incidental materials can be loaded onto the cars in the order and manner needed. In this way there will be no call for stringing out long stretches of rail far in advance of use and for which the accessories are not available; or for dumping accessories along the right of way, for rail that is yet to come, both of which are likely to cause personal injuries. If the distribution of material for rail renewals is properly planned and supervised, personal injuries should not occur.

Needs Mental Alertness

By C. E. Miller
Assistant Engineer of Maintenance, Chicago & North Western, Chicago

The distribution of rails for renewal involves a potential hazard, but with proper supervision "safety mindedness" can be attained, with no higher accident ratio than in other maintenance or construction activities. If the rail is to be distributed well in advance of laying, it should be so placed as not to interfere with passing trains or the operation of snow plows or other types of work equipment. It should not be distributed at points where it will constitute a hazard to trainmen engaged in switching, or at grade crossings where it might interfere with highway traffic.

When unloading rail by work train with a rail crane, the two key men, from a safety standpoint, are the foreman and the crane operator. The foreman should be experienced in this work so that it will be handled orderly and effectively, and he should be well grounded in safety matters, with that mental attitude that is able to recognize dangerous practices and conditions and correct them before an accident occurs. Likewise, the crane operator should be thoroughly experienced, sure of his moves and not excitable. He should know that his machine is in good operating condition, giving particular attention to cables, cable clamps, clutches and

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in June

1. *What items must be given attention in the maintenance of rail joints? What is the importance of each?*
2. *To what extent is it advisable to adhere to standard plans for small stations? What factors affect this?*
3. *When changing the type of ballast, under what conditions should the track be given a heavy lift? A light lift? How should the work be done?*
4. *Under what conditions is the use of the sand blast desirable for cleaning steel bridges? What is its relative economy?*
5. *Is it good practice to jack up the track to remove ties instead of digging them in? Why? Does the kind of ballast make any difference?*
6. *What is pump slippage? What causes it? How can it be overcome?*
7. *What measures can maintenance forces take to conserve the use of revenue equipment when handling company material?*
8. *What causes light-colored interior walls to turn yellow? How can this be prevented?*

brakes so that he will be sure of controlling the movements at all times. He should know that his machine is properly lubricated and that the cables are not being worn or cut by being dragged over fixed parts of the machine or inoperative sheaves, since all of these matters involve safety. One man should be designated to give signals to the crane operator, who should not be allowed to take signals from any other person.

Rail tongs are of extreme importance in handling rails or other heavy track material. There are several good anti-slip tongs on the market, and there is no excuse for using poorly-designed or worn tongs, since a slip is likely to result in a serious accident. The rail should be marked so that the tongs can be applied quickly at the point where the rail will balance, and the tong man should see that they are properly engaged below the head of the rail, holding them in place until the crane takes the slack for lifting the load. The rail should then be guided to clear by men stationed at each end.

New rail is loaded alternately workwise and head down. The latter rails must be turned over so that the tongs can be applied, and it is necessary for the men who turn them to protect themselves against foot injuries when these rails are turned, and they should be required to wear safety shoes. Rails 39 ft. long are sometimes shipped on flat cars not much in excess of this length, so that there is little clear space at the ends of the car on which the men using the rail forks can stand. Care must be exercised in handling the work train to avoid sudden stops or other rough handling which might cause these men to fall from the cars.

When unloading joint bars and tie plates, which are wired together in bundles, care is necessary to avoid injuring the hands on the wires, and the men handling such material should see that the ground men are clear before they drop the bundles from the car. Like all other operations, safety with which track material is handled is measured by the mental alertness and safety attitude of the men engaged in the operation, their familiarity with the job and the use of properly designed and maintained machines and tools.

Are Motor Trucks Useful?

To what extent can bridge and building forces employ motor trucks advantageously? For what purposes? Are there disadvantages?

Speaks from Experience

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

For several years our bridge and building forces have employed motor trucks, particularly for carrying men and materials to bridges and other structures in large terminals where these structures are widely scattered and are often difficult to reach with motor cars and trailers without considerable loss of time, thus increasing appreciably the cost of the work. The first trucks purchased for the bridge and building forces were acquired prior to 1931, but like other power equipment, their use is still increasing, as the value of mechanizing such operations as can be mechanized is more fully realized. Every truck in service, if it is used as it should be, will save enough in the transportation and delivery of men and materials to make it possible to purchase additional trucks from the money thus saved, as long as the need for them continues to exist.

Through the use of motor trucks it has been found possible to decrease the forces assigned to light jobs, partly because the motor truck does not need flag protection, as a heavily-loaded motor car and trailer do; and partly because the motor truck does not have to be removed from the track. The construction of dependable, smooth-surface highways parallel and adjacent to a large part of the railway mileage of the country has made it possible to employ motor trucks extensively by the bridge and building forces, for the transportation of men, materials, tools and other equipment, especially for moving paint spray and concrete outfits. The advantages of motor trucks are particularly noticeable for small jobs where men relying on train service may be compelled to spend an entire day away from headquarters to perform only an hour or two of work, or in some cases only a fraction of an hour. I cannot close this discussion without calling attention to the similar advantages of trucks for the use of water-service employees.

What has been said should not be interpreted to mean that trucks should be used indiscriminately or that every gang should have one assigned to it, for there are still many structures, particularly bridges and water stations, that cannot be reached by highways. Likewise, there are many jobs accessible to the highway where the use of trucks will not be of advantage.

Made Careful Study

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

My first experience with motor trucks dates back to 1928 when the bridge and building department on the Toronto terminal took over an old ½-ton truck formerly used by the stores department for light deliveries. It was not only in a poor state of repair, but was suffering from all of the natural infirmities of old age. Despite its feeble condition, by careful handling and emergency repairs by the driver, it was kept in operation long enough to build up a record that showed indisputably the economic value of this form of transportation for bridge and building work in a large terminal.

To determine the savings to be derived from the use of this equipment, a careful account was kept of all costs of the work performed by the truck. At the end of three months these were compared with the cost of performing the same amount and classes of work by the former methods. The result of this comparison proved conclusively that a motor truck employed in bridge and building work would pay for itself in a surprisingly short time, and no difficulty was experienced in obtaining a new truck for the use of the bridge and building forces.

It was formerly the practice to make deliveries of materials to the gangs employed on the terminal by special switching movements, transfer trains, work trains, or by push car, provided the distance was not too great and traffic would permit the use of the push car. In most cases, however, train or switching movements in a busy terminal involve much expense and delay. The normal organization of the bridge and building forces on the terminal consisted of 50 men, divided into two bridge gangs, one building-repair gang, one water-service gang and one small paint gang. The paint gang and the two bridge gangs are each provided with a tool box car, with a space partitioned off at one end for the men to eat their lunches in. These cars are placed on a siding as near the work as practicable, and become the

headquarters for starting and quitting work while the work at any particular point is under way. This eliminates the use of hand and motor cars, and the incidental loss of time traveling to and from a central headquarters through a busy terminal. When necessary to move a gang to another point, the tool car is switched during the night and the men report at the site of the work on the following morning.

All materials for all of the gangs, except bridge stringers, girders, etc., which are too large to handle, are delivered to these gangs. After the trucking service was organized it was found possible to deliver track material, that is, bolts, spikes, tie plates and even switch points and frogs to the track gangs in the terminal, thus doing away with work-train service for this purpose. Track welders are also served and deliveries of fuel are made to crossing towers, small stations, etc. Experience has shown that a two-ton truck with a 157-in. wheel base and a body 8 ft. wide by 11 ft. long is the most serviceable size. The use of this truck has reduced the use of revenue equipment by 90 per cent and there has been some reduction in the forces required for the work through elimination of waste time.

Yard or Extra Gangs?

Should the renewal of rail in yards and the general surfacing of yard tracks be done by the regular yard gangs or by an extra gang? Why?

Local Conditions Govern

By A. A. Miller
Chief Engineer Maintenance of Way, Missouri Pacific, St. Louis, Mo.

An answer to this question is best found on the ground for each particular case, since much will depend on what tracks are under consideration, and in what yards they are located. If all or most of the tracks in a yard are busy, particularly during the daylight hours, and the yardmaster has difficulty in giving up a track or tracks, and can do so for only a limited number of hours, the track work can generally be accomplished more economically by the use of an extra gang of the proper size.

If it is possible for the yardmaster to give up a track during the daylight hours without in any way jeopardizing his yard operations, and the amount of rail to be laid is not large, the regular yard gangs may be used to advantage, and many times they are so used; certainly this is true on our own road.

Again, the extent of the work and the particular place that it is to be done in the yard, which may and often does involve frog and switch work, must be given full consideration by the officer called upon to make the decision whether the work can be done most economically, from an institutional viewpoint, by an extra gang or by the regular yard gang. I wish to reiterate that the answer to this question will be found on the ground, by the officer who must study, analyze and decide the most economical and satisfactory way to do the work, keeping in mind that the results must be measured institutionally rather than departmentally.

Favors Extra Gang

By G. M. Helmig
Roadmaster, Missouri Pacific, Marquette, Kan.

Most roads program their requirements for rail, ties and general surfacing in yards the same as they do for their main-line tracks. With this fact in mind, the extra gang that is lined up for similar work on the main tracks will do the work in the yards more economically than the regular yard maintenance gang with the necessary labor added. At present, yard gangs have been reduced to the absolute minimum for the regular maintenance work and, therefore, lack the tools and experienced men to carry out effectively the larger operations of laying rail, renewing ties and general surfacing.

Generally speaking, a higher type of foreman is selected for the steel or surfacing gang, and he is usually more experienced in the types of work under consideration; his men are experienced in both the particular operation they are engaged in and in teamwork. On the other hand, the yard force, including the foreman, may be as good trackmen, but they are used to doing more detailed and widely scattered jobs, and are not organized for the kind of work required when laying rail, surfacing and other mass operations that require a high level of production. Finally, an extra gang assigned to these classes of work will free the regular maintenance forces to carry on their routine work.

No Need for Extra Gangs

By I. H. Schram
Engineer Maintenance of Way, Erie, Jersey City, N.J.

It is understood that "yard" refers to a large yard, as at a terminal or division terminal, where more than one section gang is employed regularly, together, in some cases, with a regular gang that does not have limiting territorial assignments, which is a common practice in this territory. These latter gangs are commonly used for transferring bad-order cars, handling waste material or similar chores, and are available for trackwork when not otherwise engaged. It is my experience that in such yards there is no need for extra gangs for laying rail, raising track, making general renewals on ladders or for ordinary construction work and similar jobs, for several reasons.

In the first place, the work does not have the time element that similar work on the main track has. Generally, it is possible to have the use of the track, that is an ordinary body track, for an entire working day, and of a ladder track for several hours, so that work can be done without interfering with traffic. This is a matter of operating department co-operation, however. The time element of closing the track or of completing a large amount of work in a day is, therefore, absent.

Again, there is no loss of time as a result of bunching gangs in a yard. All of the section gangs and the unassigned gang, if there is one, can be brought together without loss of time by reason of traveling on the road, as contrasted with main-track section gangs. The men in these gangs are experienced and are used to working together. There should be a general foreman in charge, so that the work will progress efficiently. If enough men are not available in this way to operate power machines and tools, additional men can be hired and placed in the gangs while the work is in progress. If this is done, the regular men will supply the experienced guidance. In recent years there has been no difficulty in hiring the extra men needed in such cases.

As the third important reason why it is more desirable and more economical to do the work with the regular forces, the expense of handling the extra gangs is avoided, including the added supervision, the camp requirements and other features that are

sometimes expensive. Gangs working within their own territory, employed in improving the condition of their own tracks, which are used to working with yardmasters, and which have established co-operative relations with them, will accomplish a great deal more work in a given time at much less expense than extra gangs.

There is, or should be, no difficulty in assigning equipment to them, for it is easily moved to the site of the work. The handling of materials, the work of cleaning up after the job is completed and other elements that require engine service, are best done with regular switch engines, since only a small part of the day will be consumed in spotting cars, no locomotive being required to move them along the track. Cars can be moved by barring along the track that has been turned over to the maintenance forces, or they can be handled with a crane. Regular forces can handle these arrangements far better, they can get better service from yardmasters and can generally accomplish a better and cheaper job than an extra gang can under favorable conditions.

When to Mark Ties for Renewal

Should ties be marked for renewals in the fall or spring? Why? How should they be marked? Who should mark them?

Prefers Spring Marking

By C. D. Turley
Chief Tie Inspector, Illinois Central, Chicago

An annual inspection of ties should be made in the fall after the season's renewals have been completed. This inspection is for the purpose of determining the following year's tie allowance and forms the basis for the ensuing tie purchases. For several years, however, there has been quite a wide spread, generally downward, between the number of ties requested by the track department and the number finally authorized by the management. For this reason, the ties should not be marked for renewal until the actual number of ties to be installed is known. Again, it occurs quite frequently that traffic is rerouted or that track conditions change enough during the winter and early spring to justify a change in the tie allotment for individual miles and, in some cases, for entire districts. In view of the uncertainty involved in making tie renewals, it seems that ties should be marked for renewal in the spring rather than in the fall, doing this just previous to starting the renewal work.

The fact that less ties are authorized than are requested, presents another important problem to the track forces. It is not enough for a section foreman to know that the ties that he removes are defective or have completed their service life; he must make sure that only the poorest ties on each mile are renewed, and that, so nearly as possible, he obtains a uniform tie condition throughout his section. Experience has shown that the most feasible way to insure this is to mark the ties for renewal. Spot painting has proved quite satisfactory, and this form of marking can be distinguished throughout the working season.

Ties that are to be renewed should be marked by the section foreman, since he is more familiar than anyone else with the condition of his tracks and with the demands made upon them. His selection should be checked by the supervisor, however, to insure that good judgment has been used and that the renewals are properly allocated by miles.

Better Results in Spring

By L. A. Rape
Track Foreman, Baltimore & Ohio, Crothers, Pa.

There is only one good reason why ties should be marked in the fall, and this is to facilitate the checking of the primary inspection and enable the management to have the needed ties on the ground by the time the weather permits renewals to begin. On the other hand, if the ties are marked in the spring, quite a few more will be marked than in the fall, for the winter always brings some added tie mortality that is difficult to foresee at the time of the fall inspection. For this reason, more ties will be renewed the first year that the change is made from fall to spring marking, but the renewals should return to normal thereafter.

It may be asked that if this is the case, what the benefits of spring marking are. Obviously, the majority of the ties that will require renewal during the following year can be pointed out without difficulty at the time of the fall inspection. In any track, however, there will be an appreciable number of border-line cases that are indeterminate; that is, decision as to their need for renewal cannot be made with certainty six months in advance. If these ties are spotted, and the next season's renewals are held rigidly to the spotted ties, as I have seen done, some ties that are suitable for further service will be thrown away and others that are unfit for service will be retained, and the tie condition will lack that approach to uniformity that is so desirable.

I am opposed to any system of marking ties for renewal that mutilates them, such as prying a chunk out with a bar or cutting them with an adze. I have seen too many cases where appearances were deceiving, and where marked ties did not need to come out, but removal was made necessary because the ties had been damaged beyond saving by a bar or adze. I believe that the marking should be done by the foreman, and that the ties should be spotted with white or yellow paint.

Prefers Fall Marking

By Gus Soutas
Track Foreman, Denver & Rio Grande Western, Richfield, Utah

Ties should be marked for renewal in the fall, at the time of the annual tie inspection. If this is done, the foreman can report to his roadmaster the number of ties he will require for the ensuing year, and at the same time leave a record that can be checked by miles. Obviously, both the inspection and the spotting should include yard and side tracks as well as main tracks.

Spring Is Best Time

By Joseph H. Becker
Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

I recommend that ties be marked for renewal in the spring, for it is easier at that time to determine the need for renewal of those ties that perhaps were only questionable in the fall when the annual tie inspection was being made. If it is desired to leave a record for checking the ties that have been listed for renewal during the inspection, it will be a simple matter to place a kiel mark on the rail, but those that are being spotted for actual renewal should receive a daub of paint. This should be bright enough, say white or yellow, to be easily discernible when the ties are

being unloaded, so that the new ties can be laid down at the point of use, and thus save later trucking.

Mark with Paint

By J. L. Monk
Section Foreman, Southern Pacific, Tombstone, Ariz.

Ties should never be spotted for renewal at the time the inspection is made, whether this be in the spring or fall. I believe that a fall inspection is preferable, but that the spotting should be delayed until immediately prior to the time renewals are to be started. In the first place, in recent years there has been a wide spread between the number of ties requested and the number allotted by the management, no matter how conscientiously the inspection has been made. Therefore, for the reason that one never knows what his tie allowance will be, it is not good policy to mark ties for renewal until one knows how many will be available.

Ties should be spotted with either white or green paint, and those that are to be spotted should be designated by the foreman. Tie spotting should never be done in installments; once begun it should be carried to completion, for a partially finished job is seldom completed. The spotting should be checked by the supervisor.

Driving Piles to Rock

What is the minimum depth to which it is safe to drive piles for trestle bents in material overlying rock? What alternatives can be adopted?

Must Have Safe Bearing

By Arthur Ridgway
Chief Engineer, Denver & Rio Grande Western, Denver, Colo.

On the assumption that this question refers only to wood piles, the minimum depth to which it is safe to drive any pile in material overlying rock is the depth which will produce the requisite safe bearing capacity without contact between the tip of the pile and the rock. Support for this conclusion follows:

A minimum measured depth cannot be fixed for all locations because of the varying character of the overlying earth in the production of skin friction, which alone determines the safe bearing power of the pile. The character of the overlying material will also determine the minimum depth for lateral stability against stream current and the deepening of the channel by erosion, which may occur at any time.

No dependence can be placed on the bearing between rock and the tip of the pile for providing supporting capacity for the pile, because of the practical impossibility of obtaining a uniform pressure over the tip area. Even though brooming of the tip by overdriving might be considered as effecting a satisfactory distribution of pressure on the rock, this will leave the bottom of the pile in a spongy condition subject to future settlement. Again, bearing on the rock and skin friction combined cannot be relied on to afford supporting capacity for a pile, for there must be some excess in one to bring the other into action. The safe carrying capacity of a pile is determined solely by resistance to penetration in driving and not by end bearing on either the rock or its overlying material.

Alternatives include (a) an increase in the diameter of the piles to the practicable maximum to augment skin friction in driving; (b) use of piles with maximum taper permissible under the specifications; (c) use of a larger number of piles and stiffening the bents with stiffer caps and braces; (d) substituting concrete piers and framed bents; and (e) changing the type of structure to eliminate wood bents and, incidentally, the need for piles of any type.

It Is Indefinite

By H. Austill
Chief Engineer, Mobile & Ohio, St. Louis, Mo.

The minimum depth to which it is safe to drive piles for trestle bents in material overlying rock cannot be stated definitely. I have blasted holes in solid rock at the bottoms of ravines, setting the piles in the holes and then filling around them with concrete to anchor them laterally. There was little soil over the rock, but with sufficient bracing these bents were entirely satisfactory.

If the piles merely rest on the rock and the overlying soil is depended on for stability, one should be sure that it will remain in place; if it is subject to scour, its thickness at the time of driving is of little consequence. If the soil may be expected to remain in place, the minimum thickness for safety is that which is necessary to hold the piles in place, provided the end bearing on the piles is sufficient to take the load without the aid of skin friction. Pile driving is not an exact science, and great damage may be done to the pile by overdriving when it lands on solid rock. For this reason it is important that driving cease as soon as the pile lands on solid rock. For the same reason, the use of steel bearing piles is advantageous in many cases. In short, a specific answer to this question will depend entirely on the local situation.

Mending Broken Pipes

Can cracked pipes or badly leaking joints in a water line be repaired without shutting off the water? If not, why? If so, how?

Often, They Can

By J. P. Hanley
Water Service Inspector, Illinois Central, Chicago

In many instances repairs to cracked pipes or to leaking joints can be made under pressure, but this will depend on the magnitude of the pressure, on the means for draining the leaking water from the trench, on the accessibility of the damaged section of the pipe line and on the mechanical ability of the repairman. Where the lead has been pushed out, leaking joints in cast-iron pipe are often repaired by excavating as usual and operating enough trench pumps to keep the water down to a level where the existing lead packing can be driven back, or the leak may be repaired by driving in shredded lead, commonly known as lead wool.

If a hole or a crack occurs in a pipe, it can often be repaired under pressure by means of a clamp or gasket secured over the hole by means of U-bolts. To do this, however, partial dewatering of the excavation is

usually necessary. Quite a line of proprietary clamps, couplings and sleeves are now on the market for making repairs to water, oil and gas pipes. Some of these are quite useful because they contain rubber gaskets or cups which, when bolted around the damaged pipe, make it unnecessary to apply jointing material in the molten state.

Where repeated trouble with leaks is likely to occur by reason of vibration or settlement, the joint should be reinforced with suitable clamps. Appliances are also available which will fully enclose the bell and spigot joint that proves to be unusually troublesome, but a simpler clamp will often stop chronic leaks.

At times the inspection and calking of submerged intake and discharge lines becomes necessary. Obviously, this must be done by a submarine diver using the usual diving equipment. In general he will use lead wool for repacking any submerged joints that give evidence of leaking.

Depends on Break

By Water Engineer

While I have no hesitation in answering yes to this question, like most questions relating to the maintenance of water facilities, any answer requires some qualifications. In other words, the practicability of making repairs without reducing the pressure in the pipe line or shutting off the water completely will depend on several factors, probably the most important of which is the magnitude of the pressure in the line. Again, it may be that a certain amount of water hammer cannot be avoided; in fact, in not a few cases this is the cause of the breaks, and it may not be safe to continue the pipe line in operation during the period while the repairs are under way. I have also seen many cases where it became necessary to shut off the water, primarily because in the emergency we did not have sufficient pumping equipment to keep the trench dewatered so long as full pressure was maintained in the pipe line. Still another factor is the nature of the crack or break.

If the trouble comes from a simple longitudinal crack, it may be possible to draw the pipe together by means of clamps placed at 15 to 18-in. intervals throughout the length of the split. If a part of the metal has been chipped or blown out, it may be possible to make the repairs by means of a split sleeve, using clamps outside of the limits of the sleeve in case the split extends that far. If the crack is transverse instead of longitudinal, the use of the split sleeve is indicated, provided the break is not complete and the pipe is not likely to pull apart. In the latter event, the sleeve can be applied and the pipe can be held by means of clamps that will prevent longitudinal movement.

Leaking joints in bell and spigot pipe can sometimes be repaired without shutting off the water, by redriving the lead, preferably with a pneumatic calking hammer, which operates on the same general principle as a tie-tamping tool or a paving breaker. If the lead has been displaced considerably, however, it will probably be advisable to shut off the water, clean out the joint and pour it again with molten lead, as was done when the line was laid. If the leak is a minor one, it may be satisfactory to make repairs by packing lead wool or similar cold jointing materials. If the joint or joints are chronic trouble makers, as in a line passing under tracks, it may be desirable to use one of the special designs of sleeve that are available for fitting over bell and spigot joints. If the leak has been caused by the stripping of a thread in a screwed coupling in a wrought iron pipe, a split sleeve provides a convenient means for stopping the leak without removing the pipe. Leakage from this latter cause is not nearly so common today as formerly, because welded joints have replaced the screwed couplings in so large a percentage of the pipe lines installed during the last 10 or 12 years.

One or Both Sides of the Tie?

When tamping by hand, should both sides or only one side of the tie be tamped? Why? Does the kind of ballast or the amount of raise make any difference?

Calls for Double Tamping

By N. P. DeNardo
Section Foreman, Alton, Odell, Ill.

Where ties are tamped by hand, the raise should always be sufficient to make it possible to pack ballast of the size in use under the tie. If the track is to be raised 1½ in. or less, the ties should be double tamped, that is, from both sides outside the rail, but the tamping inside the rail should be from one side only. The reason for this is that where the raise is light it is almost impossible to force ballast clear across the tie from one side.

If the raise is greater than 1½-in., the tamping can be done first with shovels or forks to fill the space under the ties, after which they should be tamped with picks from one side outside the rail and from the other side inside of the rail. If an attempt is made to tamp from both sides in this case, the ballast will be loosened and the ties will settle about the same as when tamped from one side when a light raise is made.

By All Means, Yes

By Bernard F. McDermott
Roadmaster's Clerk, Chicago & North Western, Redfield, S.D.

By all means, both sides of a tie should be tamped. If only one side is tamped, the untamped side will sag and tip down almost immediately and will invariably create poor-riding track. This is true for any kind of ballast, so that the kind of ballast makes no difference, except that the effect may be more pronounced in some kinds than in others. Likewise, the amount of raise will make no difference; that is, within the limits of ordinary surfacing. The underlying principle remains the same, regardless of the kind of ballast or the amount of raise. On the other hand, this discussion does not apply to a high lift where the first raise is chucked.

If the tampers are paired, they should be taught to work in unison, that is, both men thrusting at the same time on each stroke. In this way the ballast will be thrust under the tie from both sides at once, and will meet at the center to become firmly packed. The same applies to pick tamping, although the two sides will not be tamped simultaneously.

Three Things To Be Done

By W. H. King
Section Foreman, Missouri Pacific Lines, Francitas, Tex.

Ties should always be tamped on both sides, except when making a high lift, since the ballast cannot be packed from one side as well as when it is forced under the ties from both sides. Ballast that is simply packed under one edge of a tie works out easily and lets the tie down and thus causes the track to ride choppy. The higher the

track is raised, the more easily the ballast can be shoved all the way under the tie from one side. Gravel can best be tamped from one side, provided the lift is enough to make this possible, but the difficulty increases with the coarseness of the ballast until the point is reached where tamping can be done by chucking.

Three things must be done when ties are tamped, regardless of the method followed: (1) raising, (2) dressing and (3) lining. If the tamping can be done in such a manner as to hold the track so that these three items will not need to be repeated in a few days, it will be worth while to spend some time and effort to attain this objective.

Always Both Sides

By E. E. Crowley
Roadmaster, Delaware & Hudson, Albany, N.Y.

Both sides of the tie should be tamped, regardless of whether the tamping is done by hand or mechanically. This will provide a uniform bearing for the tie and permit it to provide a square and uniform bearing for the rail. If only one side of the tie is tamped, it is possible that the edge on which the tamping was done will have all of the bearing. This will permit the tie to rock and the ballast will work loose, allowing the tie to settle and thus create a soft spot in the track. Ties that are not tamped firmly will pump under passing trains, and will eventually allow water to accumulate and soft spots to develop.

The result of uneven tamping by paired tampers is overcome somewhat by tamping both sides of the tie. When tamped on one side only, the work of a poor tamper will show up quickly by the greater settlement, compared with the ties that have been tamped properly. Before ties are tamped, all loose spikes should be tapped down so that the ties will be held securely to the base of rail.

Neither the kind of ballast nor the amount of the raise should have any influence on the method of tamping. When surfacing or when making a light or heavy general raise, the object is to provide good-riding track. To insure that this object will be attained, it becomes important to know that the ties are tamped firmly and this can be assured only by tamping both sides of the ties on both sides of the rail.

What Kind of a Floor?

What are the relative advantages of wood, tile, brick, concrete and composition floors for small stations? For larger stations? Why?

The System Is Wrong

By Engineer of Buildings

This question touches on one of the principal problems connected with the construction of small stations. On those roads with which I am familiar, it is not uncommon for the management to consider that the cost of the small station should be about as completely standardized as its general design, and nine times out of ten both the design and the cost figures are sadly in need of revision. If I were given my own choice in the matter, I would never install a wood floor in any building that is subject to the use —or better, abuse—that falls to the lot of the small station, and I certainly would not use a wood floor for a large and important station, except, perhaps for the office area.

Small stations are generally combination stations, in which both passengers and freight are cared for. They are seldom as well built as the larger stations at more important points, that is, they are supported on wood blocks or concrete piers, rather than on continuous foundations, so that settlement is not uncommon. The space below the floor is open and often damp, providing excellent conditions for the acceleration of decay in the parts of the structure below the floor level. One of the rarest things I know of is an insulated floor in a small station, although insulation would be a paying investment, for which reason the floors are always cold during cold weather. Furthermore, this type of construction is an invitation to termite attack and it is my belief, based on observation, that more railway buildings are infested by termites than many engineers are willing to believe.

If given a free hand, I would build a continuous foundation, place the necessary fill and provide a concrete floor for the small station, possibly overlaying this with wood flooring for the office area. Composition and tile make excellent floors, but are too expensive for the average small station. I have known these materials, and brick, to be used effectively in suburban stations and at small stations serving resort areas. I am in favor of any of these materials, provided they can be blended into the general design and the cost of installing them can be justified. For the ordinary station, however, plain concrete is the best and most economical material, for it requires no maintenance.

Wood Is Passing

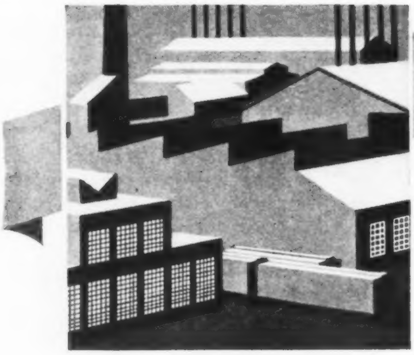
By General Inspector of Buildings

While wood floors predominate in both small and moderate sized stations, I am convinced that the day of the wood floor in passenger and freight stations is passing except for the area occupied for office purposes. Obviously, composition and tile floors are too costly for use in the average small station where the revenue is likely to be small, and this may apply to brick under some circumstances.

Besides being an eyesore, for it is seldom kept painted or cared for in other ways, wood flooring of desirable quality is surprisingly expensive. I can remember when it cost little more than the material for the frame or the siding, but today it may be the most expensive material entering into the structure. In addition, the lower members of a small station are particularly susceptible to decay by reason of the common practice of setting the building close to the ground and supporting it on pile butts.

For this reason, I have been considering some alternate plan, and I estimate that the cost of a complete foundation and the necessary fill to support a concrete floor will not be prohibitive, and that the concrete floor itself will cost approximately the same as a wood floor constructed of a good grade of material. Such construction will have the advantage of being permanent. It is recognized that the cost will be somewhat greater than for the present type of wood floor, but this additional cost should not be a burden on any railway when it is considered that only a few such stations are constructed on individual roads in any year. As an offset to this additional cost, expenditures for normal maintenance as well as for replacement will be eliminated. The concrete floor, if properly constructed, will need no paint or other treatment, and there is no fire hazard connected with it.

For the larger stations any of the flooring materials mentioned, except wood, are suitable and the selection of the material to be used will depend on the importance of the station and the architectural requirements.

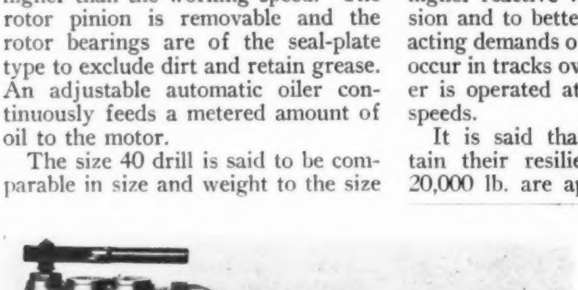


PRODUCTS of Manufacturers

Close Quarter Drill

THE Ingersoll-Rand Company, New York, has developed a new size 40, air operated, non-reversible Multi-Vane close quarter drill, weighing only 45 lb., which is designed for two-inch drilling, reaming, tapping and nut running in restricted places. The drill consists of a Multi-Vane type rotor mounted in a special-alloy cylinder connected to a No. 4 Morse taper socket. The Multi-Vane rotor is a solid type, hardened steel rotor with four or more extra wide power vanes, which are said to prevent cramping and provide a smooth flow of power. A governor is provided, which maintains uniform speed within the capacity of the drill and the free speed is only slightly higher than the working speed. The rotor pinion is removable and the rotor bearings are of the seal-plate type to exclude dirt and retain grease. An adjustable automatic oiler continuously feeds a metered amount of oil to the motor.

The size 40 drill is said to be comparable in size and weight to the size 90 drill and to develop 30 per cent greater torque. It is said also to be sturdy and compact, and built of quality materials throughout. The drill is designed to operate on 90 lb. air pressure at a speed of 150 r.p.m.

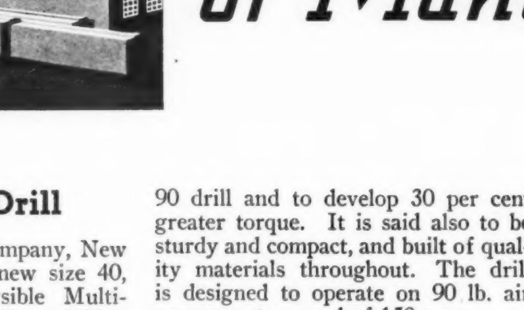


The New Size 40 Ingersoll - Rand Multi - Vane Close Quarter Drill

Improved Hy-Chrome Spring Washers

AS A result of further research, employing special laboratory and testing equipment to determine the non-fatiguing characteristics of its rail joint spring washers, the Eaton Manufacturing Company, Reliance Spring Washer Division, Massillon, Ohio, has further improved its Double-Hy-Chrome spring washer to develop a higher reactive value under compression and to better adapt it to the exacting demands of joint stresses which occur in tracks over which heavy power is operated at increasingly higher speeds.

It is said that these washers retain their resiliency after loads of 20,000 lb. are applied in accordance with the specifications of the American Railway Engineering Association, and that, at the same time, they show a reactive value of more than twice that required by these specifications. It is also claimed that they have a wide range of reaction and function well under repeated impact.



The Improved Double Hy-Chrome Spring Washer

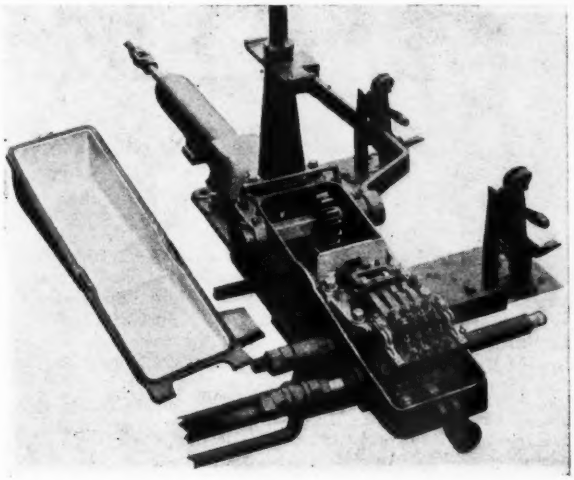
U.S. & S. Switch Stands With Facing-Point Lock

THE Union Switch & Signal Company, Swissvale, Pa., has announced improved types of manually-operated switch stands, the T-20 and T-21, and the S-20 and S-21, which perform the same functions as their predecessors, the T-10 and T-11 and S-2 and S-3. The new design, however, includes some changes in the method of operation, permits interchange of parts, is easier to operate and has been strengthened throughout to withstand more severe service imposed by increased high-speed traffic.

The T-20 and T-21 lock the switch in the normal position and provide a latching point detector; and the S-20 and S-21 perform the same functions and also provide for unlocking of the switch by a trailing train. Both provide protection equivalent to that of an interlocked switch. In other words, if the operating rod is broken or disconnected, the switch is still safe for train operation. A latching point-detector operates on a different principle from that of a simple switch circuit controller. If a switch is improperly trailed and the points later return to normal position, a simple controller will be closed, whereas a latching point-detector, once opened, stays open to hold signals at the most restrictive aspect until the switch is inspected and the damage corrected.

The new machine, as adapted for switches which are operated at all times by hand, is known as the T-20, while the S-20 is arranged for a combination of manual and spring-

buffer operation. Both machines can be furnished with a built-in target-operating mechanism and with this addition the machines are designated as the T-21 and S-21 respectively. The target mounting is so arranged that if the target is knocked off by dragging equipment the locking mechanism is not damaged.



Style S-21 Switch Stand with Facing-Point Lock, Equipped with Target

The effort required to operate a switch by hand has been reduced by utilizing an anti-friction design of the switch-throwing mechanism. When operated manually, the lock rods and bars are effective to lock the switch in the normal position. The new design permits interchangeability of parts so that any one machine can be applied for either left-hand or right-hand switch layouts, and the switch operating crank in any instance points toward the heel of the switch. Maximum protection of the internal mechanism and controllers against damage by dragging equipment has been accomplished by a new design of the case and a heavy one-piece cover. This cover is equipped with jute packing and is removably attached by a "screw-down" hasp at one end and an adjustable hinge at the other end.

An installation of the Style S-20 and S-21 includes equipment and a connection to the mid-section of the length of the switch point, so that as a train starts to trail through, the plunger is withdrawn automatically from the lock rod and the train can pass on through the switch. After the points close under the buffer spring pressure, the plunger again returns to its normal position through the lock rod. The switch is, therefore, locked for all main line train movements. A feature of the new S-20 mechanism as compared with its predecessor is that the spring which returns the lock plunger to engagement with the lock rod is 50 per cent stronger, thus effectively returning the mid-section of the switch point to its normal position.

Whereas on previous machines both an upper and lower tier of contacts were necessary for the point detector and mechanism controller, the new machines employ only an upper tier of contacts, which facilitates inspection and maintenance and still provides for the necessary circuits. An additional feature is that point-detection can be provided to check the closed position of both points, i.e., in the normal, reverse, or normal and reverse positions of a switch.

Mall Electric Concrete Vibrator

THE Mall Tool Company, Chicago, has produced a new lightweight high-speed portable electric concrete vibrator named the Universal Electric concrete vibrator and designed for one-hand operation.

The New Mall Universal Electric Concrete Vibrator Weighs Only 27 lb.

The unit weighs only 27 lb. and is equipped with a Universal electric motor geared to deliver 6,000 vibration frequencies per minute. The motor unit is connected to a 2-1/8-in. by 14-in. vibrator unit by a short coupled flexible shaft and housing 18-in. long. The unit is equipped with a switch built in the handle and with 25 ft. of two-conductor cord and plug.

The universal type motor can be furnished for operation on 110 or 220 volt A.C. of 25, 50 or 60 cycle current or on 110 or 220 volt D.C. current. It is said the vibrator unit is constructed of high quality materials which will withstand abrasive action and provide maximum performance.

New Books

Roadmasters' Proceedings

Proceedings of the Roadmasters' and Maintenance of Way Association of America for 1939, Fifty-Fourth annual convention, 163 pages, illustrated, 7 in. by 10 in., bound in cloth. Published by the Association, C. A. Lichty, secretary, 319 N. Waller Ave., Chicago. Price $2.

The feature of this volume, which contains a vast fund of practical information on current problems in track construction and maintenance, is the reports and addresses, with subsequent discussion, presented before the Fifty-Fourth annual convention of the association in Chicago on September 19-21, 1939. The reports contained in the volume have to do with the following subjects:

Heaving Track; Specialized Versus Section Gangs: Utilization of Roadway Machines; Anchoring Track; the Roadmaster's Qualifications and Duties; and the Maintenance of Curves for High-Speed Trains. The papers and addresses deal with Safety, by R. H. Smith, vice-president and general manager, Norfolk & Western; Rail Manufacture and Maintenance, by C. B. Bronson, inspecting engineer, New York Central System; and Streamlining Track for High-Speed Trains, by W. H. Hillis, assistant chief operating officer, Chicago, Rock Island & Pacific. In addition, the Proceedings presents the transactions of the opening exercises and business session of the convention; a stenographic report of the Question-Box session included in the convention program, which dealt with six questions of specific interest to maintenance of way supervisory officers; the constitution and by-laws of the association; and a directory of membership and of registration at the convention.

NEWS of the Month

Freight Trains Set Record for Speed in 1939

A new record for average speed of freight trains in the United States was established in 1939. The average distance traveled per train per day in that year was 401 miles, compared with 398 miles in 1938, 386 miles in 1937 and 247 miles in 1920. This represents the average time required for the movement of all freight trains between terminals, including delays enroute.

Crossing Fatalities Less Than Any Year Since 1915

In 1939 fatalities resulting from highway-railroad grade crossing accidents totaled 1,398, fewer than any year since 1915, a decrease of 119 compared with 1938 and a decrease of 477 compared with 1937. The total number of persons injured in highway-railroad grade crossing accidents in 1939 totaled 3,999, a decrease of 19 compared with the preceding year and a decrease of 1,137 persons compared with 1937. The number of persons injured in 1939 was less than in any preceding year since 1933.

New Eastern Fares

On March 25, the new two-cents-a-mile basic one-way coach rate of the Eastern railroads ordered by the I. C. C. went into effect. At the same time, the roads offered new sliding scale reduced rates for round-trip coach fares, for which a two-cent rate will apply for the first 100 miles of one-way distance and thereafter the rate is graduated downward until a fare of 1.5 cents per mile is reached for one-way distances of more than 900 miles. These round trip fares apply between points in Trunk Line and Central Passenger Association territories.

B. & O. Diesel Sets A Service Record

When the Baltimore & Ohio's locomotive No. 56 pulled into Washington, D. C., on February 25, it completed its 365th daily run between Chicago and Washington, a full year without a miss, for a total of more than 280,000 miles. Its performance over a route which includes some of the heaviest mountain grades in the east, is claimed to be a new all-time world record of 100 per cent availability for a 12-months' period. The No. 56 is a 3,600 hp. unit built by Electro-Motive Corporation in 1938, and the train regularly consists of from 11 to 15 Pullman cars.

Advocates Tolls to Pay Maintenance of Waterways

In a speech before the National Rivers and Harbors Congress at Washington, D. C., on March 14 and 15, Senator Bailey, Democrat of North Carolina and chairman of the Senate Commerce Committee, said that a halt must be called in government spending for the improvement and maintenance of the country's rivers and harbors and suggested that tolls should be charged those who use the waterways to defray the annual maintenance cost, which he estimated at $52,000,000. Mr. Bailey added that he was opposed to any more $407,000,000 bills such as his committee approved in the last session, but which was called back for more mature consideration this session.

Pension Payments Exceed Estimates

On June 30, 1941, when the first four years of operation of the Railroad Retirement Board under the present pension plan will have been completed, the tax collections under the provisions of the Carriers Taxing Act are expected to be eight or ten million dollars less than the original estimates, while payments of annuities and other benefits under the Railroad Retirement Act will have been about $165,000,000 more than was contemplated, according to testimony presented by Murray W. Latimer, chairman of the Retirement Board, at hearings before a sub-committee of the House. Mr. Latimer told Representative Tarver, chairman of the sub-committee, that "if conditions go along as they are now additional revenue will undoubtedly be necessary," and added that an actuarial advisory committee was now working "on a complete re-valuation of liabilities under the act."

Study Made of Railroad Traffic Losses

The Bureau of Railway Economics of the Association of American Railroads has prepared a study which shows the growing gap between total goods distributed in this country (potential traffic) and the actual volume of railroad tonnage. The analysis shows potential traffic in 1939 at 85 per cent of the 1928 level, while railroad tonnage was only 70 per cent of 1928. Based on the railroad shipments in 1928 as 100 per cent, railroad shipments were only 82 per cent of total traffic in 1939, indicating that 18 per cent of the traffic which in 1928 moved by rail is now being transported in some other manner. The study also showed that the ratio of traffic losses has grown each year without interruption.

Old Colony Asks To Abandon Boston Group Lines

The first complete abandonment of an entire group of metropolitan steam railroad lines in this country, may result from the petition to the Interstate Commerce Commission of the trustees of the New York, New Haven & Hartford and the Old Colony, to abandon the so-called Boston Group lines of the latter road. The petition seeks to close down for both freight and passenger service, some 96 route-miles of line between Boston, Mass., and Baintree, Baintree and Middleboro, Baintree and Plymouth, and Baintree and Greenbush. A large proportion of these lines are double or multiple-tracked and, before the rise of motor competition, carried one of the heaviest passenger volumes in the country.

Change Railroad Board Following Mexican Collisions

Following two train collisions on the National Railways of Mexico in which a number of passengers and employees were killed and injured, the president of the Republic requested the resignation of the entire board of administration of the Mexican Union of Railroad Workers, which operates the National Railways and a new board has been installed. In the first accident on February 25, a passenger train ran into a freight train between Queretaro and Las Adjuntas as a result of the wrong interpretation of orders by the operator of Mariscala. Nine passengers and five employees were killed and 36 passengers and 8 employees were injured in this accident. In the second accident on March 9, two passenger trains collided between Santa Catarina and Anona, as the result of another misinterpretation of orders, this time by the operator at Tomellin. In this accident two employees were killed and two passengers and eight employees were injured.

Personal Mention

General

Robert A. Gleason, assistant engineer of the Chesapeake & Ohio with headquarters at Fort Wayne, Ind., has been appointed assistant trainmaster of the Fort Wayne and Chicago divisions.

Engineering

William W. Winn, assistant division engineer of the Coast division of the Southern Pacific, with headquarters at San Francisco, Cal., has retired.

John W. Porter, office engineer of the Western region of the Canadian National, with headquarters at Winnipeg, Man., has been promoted to principal assistant engineer and right of way agent of the Western region, with the same headquarters.

A. W. Van Riper, instrumentman on the Grand Trunk Western at Detroit, Mich., has been promoted to acting assistant engineer, with the same headquarters, and with jurisdiction on the Detroit division including the Detroit terminal, succeeding **R. A. Gravelle,** who has been transferred to the industrial department.

Effective April 1, **C. T. Dike,** vice-president and chief engineer of the Chicago & North Western, with headquarters at Chicago, was relieved of his duties as chief engineer, but he will continue in his capacity as vice-president. **B. R. Kulp,** engineer maintenance, with headquarters at Chicago, was promoted to chief engineer, reporting to the chief operating officer, succeeding Mr. Dike, and **E. C. Vandenburgh,** division engineer of the Northern Iowa and Sioux City divisions, with headquarters at Sioux City, Iowa, was promoted to engineer maintenance, at Chicago, replacing Mr. Kulp. **L. R. Lamport,** supervisor of work equipment at Chicago, was promoted to division engineer at Sioux City, relieving Mr. Vandenburgh.

H. C. Johnson, engineer of maintenance of way of the Eastern Ohio division of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been promoted to assistant to the chief engineer of maintenance of way of the Central region, with the same headquarters, a newly created position. **R. H. Crew,** division engineer of the Middle division, has been advanced to engineer of maintenance of way of the Eastern Ohio division, replacing Mr. Johnson and **H. J. Kerstetter,** assistant division engineer of the Pittsburgh division has been promoted to division engineer of the Middle division, relieving Mr. Crew. **David Davis Jr.,** formerly in the office of the chief engineer at Philadelphia, Pa., has been advanced to assistant division engineer of the Pittsburgh division, succeeding Mr. Kerstetter.

C. H. Hardwick, whose promotion to district maintenance engineer on the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., was announced in the February issue, was born at Atlantic, Iowa, on February 9, 1902, and attended Iowa State College in 1919, 1920 and 1921. He entered railway service on June 9, 1917, as a section laborer on the Rock Island at Atlantic and served in this capacity during summer vacations for four consecutive years. After attending Iowa State College, he entered other employment but returned to the Rock Island in 1929 as a section foreman, later serving as an extra gang and construction foreman. In 1932, Mr. Hardwick was promoted to track supervisor, with headquarters at Manly, Iowa, but in 1932, because of a reduction in force, he returned to the position of section foreman on the Iowa division. In 1934, he was appointed a steel gang foreman and later served as an assistant roadmaster in charge of one of the system rail laying gangs. In October, 1936, he was advanced to roadmaster at Peoria, Ill., two months later being transferred to Iowa City, Iowa. Mr. Hardwick was transferred to Fairbury, Neb., in April, 1937, and to El Reno, Okla., in October, 1937. He was located at the latter point at the time of his promotion, which was effective February 1.

Roy A. Brown, whose promotion to division engineer on the Chicago, Rock Island & Pacific, with headquarters at Fairbury, Neb., was announced in the February issue, was born at Rockford, Mich., on February 15, 1902, and graduated from the University of Michigan in 1924. He entered railway service on July 1, 1924, as a rodman in the engineering department of the Rock Island, and on March 1, 1926, he was promoted to instrumentman at Trenton, Mo. On October 1, 1927, he was appointed resident engineer and served on the construction of various line changes and grade revisions on the Missouri and Illinois divisions. On May 1, 1930, Mr. Brown was promoted to division engineer, with headquarters at Cedar Rapids, Iowa, and several months later he was appointed roadmaster at Goodland, Kan. From December 1, 1930, to August, 1931, he served as an instrumentman at Fairbury, Neb., and Trenton, and on the latter date he was appointed track supervisor at LaSalle, Ill., later serving in that capacity at various points until May, 1936, when he was promoted to roadmaster, with headquarters at Cedar Rapids, Iowa. He was later transferred to Manly, Iowa, and in March, 1939, he was appointed acting division engineer, with headquarters at Fairbury, the position he held until his recent promotion.

F. S. Wilkins has been appointed division engineer on the Canadian National, with headquarters at Charlottetown, P. E. I., to succeed **Alexander Scott,** who has been transferred to Halifax, N. S., to replace **L. H. Robinson,** who has retired because of ill health, effective March 1. Mr. Robinson obtained his higher education at the School of Science, Toronto University, from which he graduated with a civil engineering degree. He entered railway service with the Canadian National in October, 1904, and was engaged on preliminary and location surveys for several years, subsequently becoming a resident engineer on construction. Later, he was in charge of the construction of the division terminal at Sioux Lookout, Ont., and on the completion of this project in May, 1913, he went with the Canadian Pacific as a location engineer. Mr. Robinson rejoined the C. N. R. as a location engineer in March, 1914, and after five years in this capacity he was promoted to division engineer, with headquarters at Bridgewater, N. S. In 1924, he was transferred to Campbellton, N. B., and three years later he was promoted to assistant engineer maintenance of way of the Atlantic region, with headquarters at Moncton, N. B. He had been stationed at Halifax as division engineer since 1933.

E. F. Manson, whose retirement because of ill health as division engineer on the Chicago, Rock Island & Pacific, with headquarters at Fairbury, Neb., was announced in the February issue, was born at Milwaukee, Wis., on February 15, 1879, and graduated from Northwestern University in 1906. He entered railway service on October 1, 1906, as an engineering apprentice on the Illinois Central and on April 1, 1907, he became a rodman on the St. Paul & Des Moines (now part of the Rock Island), later serving as a draftsman and assistant engineer. He returned to the Illinois Central on November 1, 1909, as a draftsman and instrumentman and on May 25, 1911, he went with the Rock Island as an assistant engineer. On March 9, 1913, he was promoted to office engineer to the engineer of maintenance of way of the First district at Des Moines, Iowa, and on August 21, 1915, he was appointed pilot engineer in a structural party. A year later he was promoted to master carpenter on the Minnesota division, with headquarters at Manly, Iowa. Mr. Manson was appointed special engineer reporting to the chief engineer on February 15, 1920, and in October, 1923, he was promoted to division engineer, with headquarters at Fairbury. In the fall of 1924, he was transferred to Trenton, Mo., and in July, 1936, when the Missouri division was abolished, he returned to Fairbury, Nebraska.

Track

George Jenkins, section foreman on the Canadian National at Neepawa, Man., has been promoted to roadmaster, with headquarters at Fort Rouge, Man., succeeding **H. C. Kirkpatrick,** deceased.

E. M. Gambill, roadmaster on the Missouri division of the Atchison, Topeka & Santa Fe, with headquarters at Marceline, Mo., has been transferred to Shopton (Fort Madison), Iowa, a change of headquarters.

O. H. Carpenter, roadmaster on the Union Pacific at Evanston, Wyo., has been promoted to general roadmaster, with headquarters at Pocatello, Idaho, succeeding **W. F. Hart,** who has been transferred to Omaha, Neb. Mr. Hart relieves **L. J. Overman,** who has been transferred to Denver, Colo., replacing **J. L. Gallavan,** who has retired.

H. E. Wilson, general foreman of bridges and buildings and water service on the Atchison, Topeka & Santa Fe, with headquarters at Las Vegas, N. M., has

been appointed roadmaster at that point succeeding **O. W. Thurston,** who has been transferred to Rincon, N. M. Mr. Thurston replaces **A. H. Hansbury,** whose appointment as general foreman of bridges and buildings and water service at Las Vegas, is announced elsewhere in these pages.

Martin A. Haessly, whose promotion to roadmaster on the Chicago & North Western, with headquarters at Wall Lake, Iowa, was announced in the February issue, was born at Campbellsport, Wis., on August 22, 1891, and entered railway service on August 22, 1912, as a section laborer on the C. & N. W. at Campbellsport. On May 7, 1913, he was promoted to section foreman at Eden, Wis., and served in that capacity at various points until April, 1936, when he was advanced to assistant roadmaster, with headquarters at Milwaukee, Wis., which position he held until his promotion on January 9.

Arthur L. Lechner, whose promotion to track supervisor on the Minneapolis & St. Louis, with headquarters at Fort Dodge, Iowa, was announced in the February issue, was born at Brighton, Iowa, on June 8, 1907, and entered railway service on October 17, 1922, as a section laborer on the M. & St. L. at Brighton and later worked at Olds, Iowa. On September 8, 1928, he was promoted to section foreman at Morning Sun, Iowa, and later served in that capacity at Brighton and Gifford, Iowa, being located at the latter point at the time of his promotion.

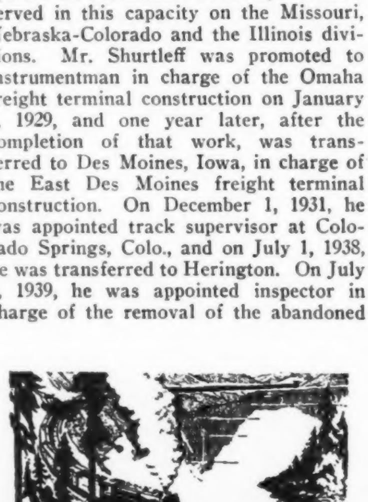
Jay Pickrel, whose promotion to roadmaster on the Chicago, Burlington & Quincy, with headquarters at Curtis, Neb., was announced in the February issue, was born at Seward, Neb., on May 12, 1902, and entered railway service on the Burlington on November 1, 1915. On March 22, 1923, he was promoted to section foreman at Aurora, Neb., a year later being transferred to Waco, Neb. Mr. Pickrel was promoted to track supervisor at Dorchester, Neb., on June 10, 1935, and on January 1, 1939, he was transferred to York, Neb., where he was located until his promotion on January 1.

James Toohey, whose retirement on December 31, 1939, as roadmaster on the Chicago, Burlington & Quincy at Sterling, Colo., was announced in the February issue, was born in Monroe County, Wis., on August 12, 1870, and entered railway service on June 1, 1890, as a section laborer for the Burlington on the line from Holdredge, Neb., to Cheyenne, Wyo., in Western Nebraska and Northeastern Colorado. In 1891, he transferred to the bridge department and in 1898, he was promoted to fence foreman. A year later he was advanced to bridge foreman and in 1904, he was promoted to master carpenter and roadmaster. In 1906, he was appointed roadmaster, with headquarters at Sterling, where he was located until his retirement.

Manuel Bourne, whose retirement as roadmaster on the Canadian Pacific, with headquarters at Lloydminster, Sask., was announced in the March issue, was born at Lancaster, Ky., on June 4, 1875, and entered railway service in 1898 in the track department on the Chicago division of the Illinois Central. In the fall of 1914, he went with the Canadian Pacific as a roadmaster at Swift Current, Sask., and a short time later he was transferred to Wilkie, Sask. In 1923, he was transferred to Olds, Alta., and in 1931, to Calgary, Alta. Mr. Bourne was transferred to Lloydminster in 1934, where he remained until his retirement.

Edward J. Boland, whose retirement as track supervisor on the Illinois Central at Freeport, Ill., was announced in the March issue, was born at Yates City, Ill., on February 2, 1870, and entered railway service in April, 1884, as a section laborer on the Toledo, Peoria & Western. In 1886, he went with the Atchison, Topeka & Santa Fe, working at various points on construction and maintenance between Chicago and Kansas City, Mo. In 1893, he went with the Chicago, Milwaukee & St. Paul on construction work, later being promoted to section foreman and four years later he went with the Great Northern on grade and line change work in Montana. He returned to the Santa Fe in 1899, and served as a section and extra gang foreman in Arizona until 1902, when he returned to the Milwaukee as a general foreman in the terminal at Milwaukee, Wis. From 1906 to 1910, he served on the Union Pacific as a roadmaster and an assistant division engineer and on the latter date, he went with the Illinois Central as track supervisor at Water Valley, Miss. In 1912, he was advanced to roadmaster at Freeport, Ill., and later was appointed track supervisor at that point.

John W. Shurtleff, whose promotion to roadmaster on the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., was announced in the March issue, was born at Omaha, Neb., on August 3, 1904, and entered railway service on March 20, 1923, as a chainman on the Rock Island double track construction between Herington, Kan., and Latimer, later serving as a chainman and a rodman on the Kansas division. On March 1, 1926, he was appointed a masonry inspector on the Kansas division, and later served in this capacity on the Missouri, Nebraska-Colorado and the Illinois divisions. Mr. Shurtleff was promoted to instrumentman in charge of the Omaha freight terminal construction on January 1, 1929, and one year later, after the completion of that work, was transferred to Des Moines, Iowa, in charge of the East Des Moines freight terminal construction. On December 1, 1931, he was appointed track supervisor at Colorado Springs, Colo., and on July 1, 1938, he was transferred to Herington. On July 8, 1939, he was appointed inspector in charge of the removal of the abandoned main line between Kismet, Kan., and Hayne and on October 26, 1939, he was appointed assistant roadmaster in charge of the removal of the abandoned portion of the Leavenworth line. On January 8 he returned to his former position as track supervisor at Herington, where he was located at the time of his promotion.



Special

H. Mayer, supervisor of scales of the Chicago & North Western, with headquarters at Chicago, has been appointed supervisor of scales and work equipment, a consolidated position, succeeding to the duties of **L. R. Lamport,** supervisor of work equipment, whose promotion to division engineer at Sioux City, Iowa, is announced elsewhere in these columns.

Bridge and Building

A. H. Hansbury, roadmaster on the Atchison, Topeka & Santa Fe at Rincon, N. M., has been appointed general foreman of bridges and buildings and water service at Las Vegas, N. M., succeeding **H. E. Wilson,** whose appointment as roadmaster at Las Vegas, is announced elsewhere in these columns.

R. V. Wickman, a bridge foreman on the Eastern division of the New York Central, has been promoted to assistant supervisor of bridges and buildings on the same division, with headquarters at Beacon, N. Y., to succeed **U. S. Hitesman,** who has retired. **G. H. Hout** has been appointed assistant supervisor of bridges and buildings on the Syracuse division, with headquarters at Rochester, N. Y., to succeed **P. F. Eckelberger,** who has retired.

H. E. Wells, general foreman of bridges and buildings on the Missouri division of the Atchison, Topeka & Santa Fe, with headquarters at Marceline, Mo., has retired, and **Ernest Pulis,** acting general foreman of bridges and buildings on the Illinois division, with headquarters at Chillicothe, Ill., has been promoted to general foreman of bridges and buildings of the Illinois and Missouri division, with the same headquarters.

Mr. Wells was born at New Matamoras, Ohio, on November 2, 1877, and entered railway service on May 20, 1895, as a laborer in a bridge and building gang on the Oklahoma division of the Santa Fe, later being advanced to carpenter. In 1898 and 1899, he served on construction on the Eastern Oklahoma division as carpenter and foreman and later served as a carpenter on the Middle division and the Chicago division. In April, 1903, he was promoted to foreman on the Missouri division and in September, 1916, he was advanced to assistant general foreman. Mr. Wells was promoted to general foreman of bridges and buildings and water service, with headquarters at Marceline in March, 1921, and remained in that position until his recent retirement because of ill health.

John Hansel Brandt, a bridge and building foreman on the Chesapeake & Ohio, has been promoted to supervisor of bridges and buildings of the Hocking di-

vision, with headquarters at Columbus, Ohio, succeeding **Charles Edward Bain,** who has retired.

Mr. Brandt was born at Erving, Ohio, on December 25, 1884, and entered railway service on October 16, 1907, as a carpenter on the C. & O. On May 3, 1910, he was promoted to foreman and on March 1, 1917, he resigned. He later worked for a time as a cabinet maker at Logan, Ohio, and on January 20, 1925, he re-entered the service of the C. & O., and was promoted to bridge and building foreman on September 1, 1926, the position he held until his recent promotion to supervisor of bridges and buildings.

Mr. Bain was born in Ohio on November 16, 1872, and entered railway service on October 23, 1894, as a carpenter on the Hocking Valley (now part of the C. & O.). Four years later he was promoted to carpenter foreman and in 1908 he was advanced to bridge foreman. On May 1, 1930, when the Hocking Valley was merged with the C. & O., his title was changed to supervisor of bridges and buildings, the position he held until his recent retirement.

Obituary

William Perry Welch, roadmaster on the Missouri Pacific at McGehee, Ark., who had been on a leave of absence because of illness since August 1, 1939, died on February 4, in a hospital at Greenville, Miss. Mr. Welch was born in 1878 and entered the service of the Missouri Pacific on April 1, 1912, as a section foreman, later becoming an extra gang foreman. On April 28, 1924, he was promoted to roadmaster at Eudora, Ark., being transferred to McGehee a few months later.

Winfield Scott Perry, who retired as supervisor of bridges and buildings of the Chicago, Burlington & Quincy lines west of the Missouri river, with headquarters at Lincoln, Neb., on February 1, 1925, died March 14 in Lincoln at the age of 89. He was born in Ripley, Ohio, and started with the Burlington in 1874 as a laborer at Plattsmouth, Neb. In 1875, he was employed as a bridge carpenter and transferred to Lincoln, advancing in this department to supervisor of bridges on May 1, 1906.

Richard W. Sheffer, superintendent of freight transportation of the Eastern region of the Pennsylvania, with headquarters at Philadelphia, Pa., and an engineer by training and experience, died March 9 in the Pennsylvania hospital at the age of 37. A biographical sketch of his career, accompanied by a photograph, was published on page 372 of the June, 1939, issue, following his promotion to superintendent of the Wilkes-Barre division. Mr. Sheffer was recently promoted to superintendent of freight transportation at Philadelphia.

Bluford Violett, who retired on September 1, 1931, as general roadmaster on the Fort Worth & Denver City, with headquarters at Ft. Worth, Tex., died at El Paso, Tex., of a stroke on January 20, while returning from a trip to Mexico. Mr. Violett was born at Winchester, Ill., on December 24, 1857, and entered railway service at that point as a trackman on the Chicago, Burlington & Quincy. Four years later he was promoted to section foreman at Merritt, Ill., and until 1905 he served alternately in this capacity and as an extra gang foreman, being in that year promoted to roadmaster, with headquarters at Beardstown, Ill. In 1920, he was sent to Ft. Worth as general roadmaster of the F. W. & D. C. (a subsidiary of the Burlington), the position he held until his retirement.

James C. Irwin, retired valuation engineer of the Boston & Albany and a past president of the American Railway engineering Association (1937-8), died at Boston, Mass., on March 20, after an illness of several weeks. Mr. Irwin retired from active service in 1938, after 46 years service with the New York Central System, of which the Boston & Albany is a constituent line. He was born at Cheyney, Pa., on September 23, 1868, and graduated from the University of Pennsylvania. He first entered the service of the New York Central in 1892 on signal construction. In the following year he became an assistant trainmaster, and in 1894, he was promoted to superintendent of the Hudson River Bridge Company, later becoming assistant superintendent of signals of the Mohawk division, division engineer of the Middle division, and general assistant to the chief engineer, and engineer of signals. Late in 1902, he was appointed assistant to the general superintendent, and in the following year he was made superintendent of the Lake Erie, Alliance & Wheeling (part of the N. Y. C.). Later in the same year, Mr. Irwin became attached to the staff of the vice-president of construction, and from 1906 to 1909 he served as superintendent of construction in the electrified zone and as resident engineer on the construction of the Grand Central terminal at New York. Mr. Irwin then became chief engineer of the Rutland, but after three years in this capacity he went with the Boston & Albany as valuation engineer, which position he held until his retirement. Among other activities, he had served as chairman of the Standards Council of the American Standards Association, as a director of the A. S. A., and as president of the New England Railroad Club.

James C. Irwin

Association News

Wood-Preservers' Association

Departing from its long-established practice of convening its annual meeting on the fourth Tuesday in January, the Executive committee has voted to change the date for its 1941 meeting dates to February 4-6.

Roadmasters' Association

Members of the Executive Committee met in Chicago on Monday, March 11, with President G. L. Sitton, Vice-Presidents J. J. Clutz and A. B. Hillman, Secretary C. A. Lichty, Treasurer E. E. Crowley, Executive Committee members E. J. Brown, H. E. Kirby, R. S. Kniffen and E. L. Banion, and Past Presidents H. R. Clarke and Elmer T. Howson present. R. J. McComb, president, and Lewis Thomas, secretary-treasurer, of the Track Supply Association were also present for a short time. The meeting was devoted to the transaction of the routine business of the organization. Nine supervisory maintenance officers were elected to membership, bringing the number of new members elected since the last convention to 52.

The Proceedings of the 54th annual convention held in Chicago last September have come from the printer and were mailed to the members late in March.

Maintenance of Way Club of Chicago

Eighty-six members and guests were in attendance at the meeting of the club on March 25, which was addressed by Roy S. Belcher, manager of treating plants, Atchison, Topeka & Santa Fe System, on The Trackman's Responsibility for Getting the Most Out of Crossties. After pointing out the magnitude of the expenditures made annually by the railroads for crossties and the large opportunity thus afforded for savings through prolonging the life of ties, Mr. Belcher discussed the many practices developed and carried out on the Santa Fe to secure the greatest life from these important elements of the track structure and thereby the maximum return from the investment made in them. His remarks were followed by an interested discussion which was participated in by a number of men specializing in tie and timber preservation on the railways.

The next meeting of the club, which will be held on April 22, will be the annual meeting, and will be addressed by A. A. Miller, engineer maintenance of way and structures, Missouri Pacific, on Methods of Stabilizing the Roadbed.

American Railway Engineering Association

At the meeting of the Board of Direction immediately following the close of the convention in Chicago on March 14, it was announced that, acting upon the recommendation of J. E. Armstrong, chief engineer, Canadian Pacific, its chairman, the Special Committee on Complete Roadway and Track Structure had been discontinued.

It was also announced that the next convention of the association will be held in Chicago on March 11, 12 and 13, 1941.

The committees on Outline of Work and Personnel have completed the make-up of committees and the assignment of subjects for the ensuing year, and the booklet containing the assignments and personnel of committees will be mailed to all members of committees during the first week in April. This booklet, in accordance with an announcement made, will show three new committee chairmen, W. H. Penfield, chief engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago, who succeeds J. V. Neubert, chief engineer of maintenance of way, New York Central System, New York, as chairman of the Committee on Rail; C. H. Mottier, engineering assistant to vice-president, Illinois Central, Chicago, who succeeds Hadley Baldwin, retired special engineer, New York Central Lines, Cincinnati, as chairman of the Committee on Yards and Terminals; and Elmer T. Howson, western editor, *Railway Age*, and editor, *Railway Engineering and Maintenance*, Chicago, as chairman of the recently re-established Committee on Co-operative Relations With Universities.

In accordance with previous action of the Board of Direction, ballots on certain amendments to the constitution will be submitted to the membership early in April, the most important of these amendments providing for a junior grade of membership for which engineering employees of the railways who have had not less than three years railway experience or who have graduated in engineering from schools of recognized standing, are eligible.

Only one committee has arranged for a meeting in April, this being the Committee on Buildings, which will meet in Detroit, Mich., on April 18.

Bridge and Building Association

Forty-nine members took advantage of their presence in Chicago during the A.R.E.A. convention to attend a luncheon on Tuesday noon, March 12, at which the affairs of the association were discussed.

The Proceedings of the 46th annual convention, held in Chicago last October, are now in the bindery and will be ready for distribution to the members shortly after April 1.

The officers and members of the Executive committee have completed the selection of the personnel of committees to study and report at the next convention in October, and all committee members have been notified. As announced by President A. E. Bechtelheimer (Chicago & North Western), the committees are as follows:

Detection and Elimination of Termites in Railway Structures—T. H. Strate (chairman), div. engr., C. M. St. P. & P., Chicago; F. H. Masters (vice-chairman), ch. engr., E. J. & E., Joliet, Ill.; E. L. Rankin (vice-chairman), arch., G. C. & S. F., Galveston, Tex.; Maxfield Bear, est., C. & N. W., Chicago; H. I. Benjamin, chm. sys. ins. com., S. P., San Francisco, Cal.; C. W. Boyce, supvr. b. & b., I. C., Vicksburg, Miss.; H. B. Christianson, div. engr., C. M. St. P. & P., Savanna, Ill.; T. B. Collidge, asst. supvr. b. & b., N.Y.C., Syracuse, N.Y.; J. E. Heck, bridge insp., C. & O., Peru, Ind.; H. Heiszenbuttel, supvr. b. & b., C. & N. W., Norfolk, Neb.; N. D. Howard, managing editor, *Railway Engineering and Maintenance*, Chicago; W. W. Kerr, Jr., instman, C. & N. W., Chicago; P. L. Koehler, div. engr., C. & O., Ashland, Ky.; C. A. Landstrom, mast. carp., C. B. & Q., Burlington, Ia.; B. W. Logan, gen'l. for. b. & b., C. R. I. & P., Little Rock, Ark.; C. A. J. Richards, mast. carp., Penna., Chicago; F. H. Soothill, ch. est., I. C., Chicago; L. R. Thompson, supvr. b. & b., M. & St. L., Oskaloosa, Ia.; K. J. Weir, water insp., C. M. St. P. & P., Chicago; B. M. Whitehouse, insp., C. & N. W., Chicago.

Inspection of Buildings to Formulate the Maintenance Program—J. L. Varker (chairman), supvr. b. & b., D. & H., Carbondale, Pa.; L. E. Peyser (vice-chairman), asst. arch., S. P., San Francisco, Cal.; H. L. Barr, div. engr., C. & N. W., Chadron, Neb.; J. E. Bird, insp., N.Y.C., Corning, N.Y.; P. B. Collier, asst. supvr. b. & b., M. P., Monroe, La.; G. S. Crites, div. engr., B. & O., Punxsutawney, Pa.; V. E. Engman, ch. carp., C. M. St. P. & P., Savanna, Ill.; W. J. Hanson, gen'l. for. b. & b., D. & M., Tawas City, Mich.; W. A. Hutcheson, supvr. b. & b., C. & O., Clifton Forge, Va.; H. G. Johnson, instman., C. M. St. P. & P., Ottumwa, Ia.; L. P. Kimball, engr. bldgs., B. & O., Baltimore, Md.; W. F. Meyers, supv'r. b. & b., C. & N. W., Boone, Ia.; E. Nelson, supv'r. b. & b., C. & N. W., Huron, S.D.; J. W. Secker, bldg. insp., C. M. St. P. & P., Chicago; E. E. Tanner, gen'l. supvr. b. & b., N.Y.C., Albany, N.Y.; F. W. White, supvr. b. & b., L. V., Buffalo, N.Y.; L. Yeager, b. & b. insp., N.Y.C., Syracuse, N.Y.

Mechanization of Bridge and Building Forces—M. H. Dick (chairman), eastern editor, *Railway Engineering and Maintenance*, New York; R. D. Ransom (vice-chairman), supvr. b. & b., C. & N. W., Madison, Wis.; A. M. Glander, ch. carp., C. M. St. P. & P., Mason City, Ia.; A. R. Harris, off. engr., C. & N. W., Chicago; J. E. Hogan, asst. engr., C. & O., Hinton, W. Va.; C. E. Horrom, mast. carp., Alton, Bloomington, Ill.; Carl Kohler, supvr. bridges, Erie, Cleveland, Ohio; W. J. Martindale, for. bridges, T. H. & B., Hamilton, Ont.; A. L. McCloy, supvr. b. & b., P. M. Saginaw, Mich.; E. C. Neville, b. & b. mast., C. N., Toronto, Ont.; G. A. Rodman, gen'l. supvr. b. & b., N. Y. N. H. & H., New Haven, Conn.; G. L. Sitton, ch. engr. m. w. & s., Sou., Charlotte, N.C.; E. R. Tattershall, supvr. structures, N.Y.C., New York; J. W. Wiggins, supt. b. & b., B. & A., Houlton, Me.; J. J. Wishart, supvr. b. & b., N. Y. N. H. & H., Boston, Mass.; J. A. Wishart, asst. supvr. b. & b., N. Y. N. H. & H., Hartford, Conn.

The Storage and Delivery of Bridge and Building Materials—R. E. Caudle (chairman), asst. engr. structures, M. P., Houston, Tex.; W. A. Batey (vice-chairman) sys. bridge insp., U. P., Omaha, Neb.; Van S. Brokaw (vice-chairman), asst. engr., C. M. St. P. & P., Chicago; M. D. Carothers, div. engr., Alton, Bloomington, Ill.; H. M. Church, gen'l. supvr. b. & b., C. & O., Richmond, Va.; F. A. Haley, bridge insp., N.Y.C., Brewster, N.Y.; H. M. Harlow, asst. supvr. b. & b., C. & O., Clifton Forge, Va.; F. W. Hillman, asst. engr. main., C. & N. W., Chicago; J. S. Huntoon, bridge engr., M. C., Detroit, Mich.; L. Koehly, ch. carp., C. M. St. P. & P., Ottumwa, Ia.; D. A. Manning, supvr. b. & b., C. & N. W., Chicago; C. D. Malloy, for. b. & b., M. P., Piedmont, Mo.; F. A. Scites, supvr. b. & b., C. & O., Huntington, W. Va.; Wm. Wilbur, bridge insp., C. & N. W., Chicago.

Protecting Steel Structures from Severe Corrosion—A. M. Knowles (chairman), asst. engr. structures, Erie, Cleveland, Ohio; R. W. Johnson (vice-chairman), asst. engr., C. M. St. P. & P., Chicago; H. M. Buell, bridge insp., U. P., Omaha, Neb.; Armstrong Chinn, ch. engr., Alton, Chicago; H. H. Eggleston, for. b. & b., C. G. W., Des Moines, Ia.; J. M. Erickson, supvr. b. & b., Ann Arbor, Owosso, Mich.; L. D. Garis, bridge insp., C. & N. W., Chicago; H. W. Hauerslev, ch. dftsman, C. M. St. P. & P., Chicago; J. W. Kidd, supvr. b. & b., Sou., Atlanta, Ga.; E. M. McCabe, supvr. b. & b., B. & A., Pittsfield, Mass.; F. M. Misch, insp., S. P., Redding, Cal.; J. M. Salmon, Jr., asst. supvr. b. & b., L. & N., Louisville, Ky.; C. U. Smith, G. M. & C. E., Harbor Com., Milwaukee, Wis.; H. C. Stevens, gen'l. for. b. & b., N. Y. N. H. & H., Boston, Mass.; M. G. Tribe, mast. carp., Erie, Salamanca, N.Y.; J. L. Vogel, bridge engr., D. L. & W., Hoboken, N.J.; W. W. Walkden, bridge engr., C. N., Winnipeg, Man.; W. E. White, gen'l. for. b. & b., A. T. & S. F., Chanute, Kan.; H. A. Wistrich, bridge engr., L. V., Bethlehem, Pa.

The Heating of Locomotive Terminal and Shop Buildings—I. A. Moore (chairman), supvr. b. & b., C. & E. I., Danville, Ill.; L. C. Winkelhaus (vice-chairman), arch. engr., C. & N. W., Chicago; U. S. Attix, gen'l. fire prev. engr., S. P., San Francisco, Cal.; J. K. Bonner, supvr. b. & b., N.Y.C., Buffalo, N.Y.; G. E. Boyd, associate editor, *Railway Engineering and Maintenance*, Chicago; E. H. Brown, bldg. supt., N. P., St. Paul, Minn.; H. M. Ferry, mast. carp., Erie, Youngstown, Ohio; M. A. Higgins, dftsman., C. & N. W., Chicago; Geo. Hout, bridge insp., N.Y.C., Albany, N.Y.; J. J. LaBat, asst. supvr. b. & b., M. P., Poplar Bluff, Mo.; T. D. McMahon, arch., G. N., St. Paul, Minn.; N. F. Podas, ch. engr., Minn. Trans. Ry., St. Paul, Minn.; J. S. Vreeland, associate editor, *Railway Engineering and Maintenance*, Chicago; J. A. Wilson, asst. engr., C. & N. W., Chicago.

Repair and Renewal of Ballast Deck Bridges—W. A. Sweet (chairman), gen'l. for. b. & b., A. T. & S. F., Newton, Kan.; L. G. Byrd (vice-chairman), supvr. b. & b., M. P., Poplar Bluff, Mo.; F. A. Baker, for. b. & b., S. P., Springfield, Ore.; F. G. Campbell, asst. ch. engr., E. J. & E., Joliet, Ill.; A. B. Chapman, office engr., C. M. St. P. & P., Chicago; R. W. Cook, gen'l. bridge insp., S. A. L., Norfolk, Va.; F. G. Elmquist, bridge insp., C. M. St. P. & P., Chicago; R. L. Fox, rdm., Sou., Alexandria, Va.; B. H. Goodwin, supvr. b. & b., Sou., Atlanta, Ga.; H. A. Gerst, asst. engr., G. N., St. Paul, Minn.; G. H. Holmes, supvr. b. & b., M. P., Falls City, Neb.; A. C. Jones, supvr. b. & b., Sou., Wilton, Ala.; A. E. Kile, b. & b. carp., S. P., El Paso, Tex.; J. B. Lodeski, asst. gen'l. bridge insp., C. & N. W., Chicago; Alex Sirel, dftsman., C. & N. W., Chi-

cago; A. C. Tanner, supvr. b. & b., N.Y.C., Weehawken, N.J.; R. A. Whiteford, div. engr., C. M. St. P. & P., Ottumwa, Ia.

Adjustment of Locomotive Watering Facilities to Larger Tenders and High-Speed Trains—W. G. Powrie (chairman), engr. w. s., C. M. St. P. & P., Chicago; A. S. Krefting (vice-chairman), asst. engr., M. St. P. & S. S. M., Minneapolis, Minn.; R. T. Burns, supvr. w. s., C. & N. W., Boone, Ia.; L. A. Cowsert, water insp., B. & O., Dayton, Ohio; C. E. Crippen, asst. engr., C. M. St. P. & P., Chicago; E. G. Day, ch. engr., L. S. & I., Marquette, Mich.; E. E. Fobes, asst. supvr. b. & b., N.Y.C., Albany, N.Y.; C. G. Freits, asst. supvr. b. & b., C. & N. W., Winona, Minn.; A. W. Harlow, mast. carp., Erie, Huntington, Ind.; C. R. Knowles, supt. w. s., I. C., Chicago; A. F. Gilman, asst. engr., C. & N. W., Sioux City, Ia.; J. H. McClure, b. & b. mast., C. N., Moncton, N.B.; L. R. Morgan, transitman, N.Y.C., Syracuse, N.Y.; K. L. Miner, supvr. b. & b., N.Y.C., Beacon, N.Y.; E. E. R. Tratman, civil engr., Wheaton, Ill.; M. P. Walden, asst. supvr. b. & b., L. & N., Evansville, Ind.; D. C. Yates, Jr., for. w. s., Alton, Bloomington, Ill.

Supply Trade News

Personal

John E. Carroll, who has been in charge of the southwestern offices of the **American Hoist & Derrick Company,** St. Paul, Minn., has been appointed manager of the Chicago office.

J. B. Templeton, vice-president of **Templeton, Kenly & Company,** Chicago, has been elected president to succeed **W. B. Templeton,** who is now chairman of the board. J. B. Templeton has been associated with the company since 1928. After working in the shops and office, he entered the sales department and later became manager of the New York office. In 1935, when W. B. Templeton, who founded the firm in 1899, traveled to develop the company's business in foreign countries and remote parts of the world, J. B. Templeton assumed the duties of the vice-president and sales manager.

J. B. Templeton

Winton J. Heinz has been appointed manager of railway track, bridge and building equipment for the Ingersoll-Rand Company, with headquarters at New York, effective March 1. He was formerly central manager of the railroad department of this company, with headquarters at Cleveland, Ohio. In his new capacity Mr. Heinz succeeds **William H. Armstrong,** manager of tie tamper sales, who will retire on September 1.

Winton J. Heinz

Mr. Heinz was born on March 4, 1907, at Cleveland, Ohio, and was educated at the Case School of Applied Science, graduating in mechanical engineering in 1929. In June of the same year he entered the service of the Ingersoll-Rand Company in the general sales department at Columbus, Ohio, later being transferred to Cleveland. In 1935, he was promoted to central manager of the railroad department with the same headquarters, holding this position until the time of his recent appointment as manager of railway track, bridge and building equipment.

William H. Armstrong

Mr. Armstrong was born on February 19, 1874, in Dublin, Va., and was educated at the Virginia Polytechnic Institute, graduating in 1893. During the early years of his career Mr. Armstrong served in various capacities on the Norfolk & Western and later was connected with the Richmond Locomotive Works. In 1901 he went with the Chicago Pneumatic Tool Company as assistant manager of the Chicago office and purchasing agent, subsequently being transferred to New York as office manager. In 1903, he became identified with the Ingersoll Sargent Drill Company, serving successively as assistant manager and manager of pneumatic tool sales. In 1905, the Ingersoll Sargent Drill Company was consolidated with the Rand Drill Company, to form the Ingersoll-Rand Company, and Mr. Armstrong continued with the new concern. He became manager of tie tamper sales in 1913, and pioneered in the introduction of pneumatic tie tampers on the railroads. Mr. Armstrong has been active in the affairs of a number of railroad clubs and associations and is a past president of the Track Supply Association.

Trade Publications

Rockflux—The Flexrock Company, Philadelphia, Pa., has issued an illustrated four-page folder devoted to Rockflux, an acid-resistant floor resurfacing material. The booklet discusses the applications and advantages of this material and gives instructions for its application.

Barco Tytampers—An eight-page catalog, No. 655, has been published by the Barco Manufacturing Company, Chicago, describing the construction and operation of its K-1 and TT-2 type Tytampers. The catalog, which is printed in color, is attractively illustrated with numerous photographs.

Station Modernization—The Johns-Manville Sales Corporation, New York, has published a 12-page illustrated brochure devoted to the subject of station modernization. The purpose of this booklet is to show how various building materials produced by this company, such as roofing, siding and wall and floor coverings, can be employed in the renovation of old stations. Among the illustrations in the booklet are a number of combinations of photographs showing before-and-after views of the interiors and exteriors of remodeled structures.

Coal, Sand and Cinder Plants—Bulletin No. 38 has been published by the Ross and White Company, Chicago, consisting of 16 pages describing the locomotive coal, sand and cinder plants and equipment manufactured by this company. The bulletin is well illustrated with photographs and drawings of plant installations and equipment and includes descriptions of N. & W. and multiple track cinder handling plants; the Red-Devil and direct electric type engine coalers; sand dryers, valves, spouts and storage towers and coal buckets, gates and lowering chutes.

Aluminum House Paint—The Aluminum Company of America, Pittsburgh, Pa., has issued a 28-page booklet entitled "Fifteen Years Behind the Brush," which presents the merits of aluminum paint as a priming coat for wood. The booklet explains the fundamental characteristics of aluminum paint, shows how it differs from other paints and the reasons for its resistance to the weathering effects of sunlight, rain, wind and rapid temperature variations. The booklet concludes with a discussion of the various applications of aluminum house paint and the proper manner of applying it.

TO RAILWAY SUPPLY MANUFACTURERS

An Exhibit Every Month

"Bill, that exhibit* was a great success, wasn't it?" asked the sales manager of his star railway salesman.

"It certainly was, Boss. Seven more companies than last year."

"There were a lot of railway men there too."

"I'll say there were—more than last year. And did you see how they studied our products?"

"I certainly did."

"We made a fine start at that show. But we've got to keep it up."

"That's right—and that's *your* job."

"Is that so! I'll do what I can but I've got to have help."

"What do you need?"

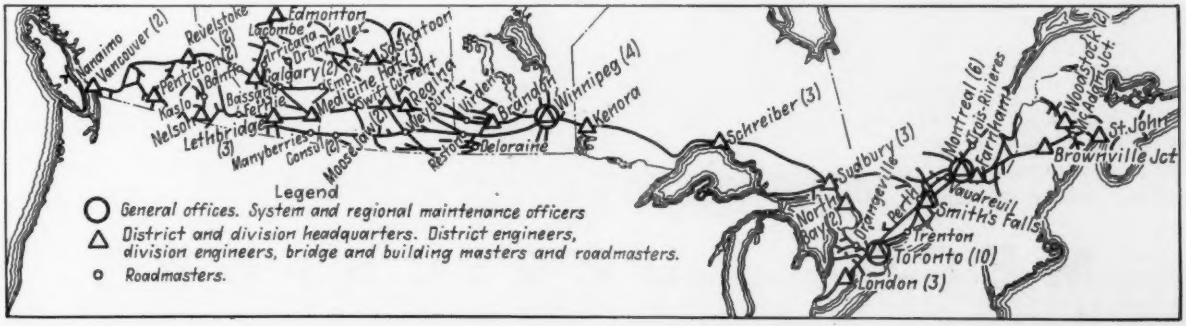
"I want a regular advertising campaign in *Railway Engineering and Maintenance*. All those men we met at the exhibit read that paper. It's their bible. Its pages comprise an exhibit every month."

"You mean that this advertising will keep *our* exhibit and *our* materials before these men all through the year?"

"That's it, Boss."

"I see your point. You're right. We need an all-year-round exhibit. We'll start in the next issue."

***Of the National Railway Appliance Association at the International Amphitheatre, Chicago, on March 11-14.**



Railway Engineering and Maintenance Goes Every Month to 83 Maintenance Supervisory Officers of the Canadian Pacific at **3 General and Regional Offices, 25 Division Offices and 23 Other Supervisory Headquarters,** Scattered All the Way from St. John, N. B., to Edmonton, Alta., and Vancouver, B. C. This magazine goes also to 114 Other Subordinate Officers Who Are in Training for Promotion to Supervisory Positions on This Railway.

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

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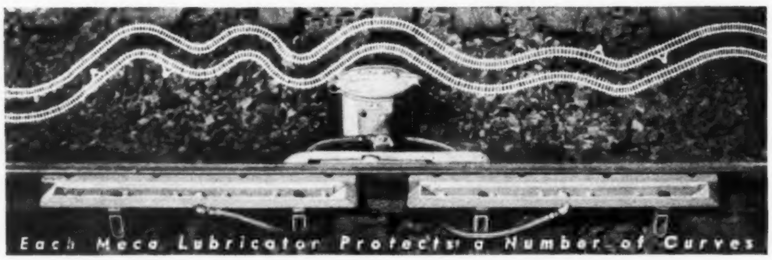

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MAINTENANCE EQUIPMENT COMPANY

RAILWAY EXCHANGE BUILDING, CHICAGO

POWER
FOR THE BIG JOBS
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Stanley Electric Drills have these handy features: chuck key is held in the gear housing . . . pipe handle and pipe handle casting can be detached . . . portable, easy to handle and plenty of power. Ask for demonstration and specification sheets. Stanley Electric Tool Division, The Stanley Works, 160 Elm Street, New Britain, Connecticut.

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"COST LESS PER YEAR"

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A Double Barrelled JOB

DITCHING - WIDENING SHOULDERS

When you set a machine out on line far from repair facilities to do an important ditching job before the spring rains arrive you want to KNOW that it has the ruggedness to stay on the job and the speed and capacity to get the work done in the time allotted.

The Model 375 AMERICAN GOPHER is Rugged; It is Fast; It handles like a polo pony.

Two new ones working in Oklahoma for the Rock Island R. R. have exceeded the expectations of the maintenance of way department by a wide margin.

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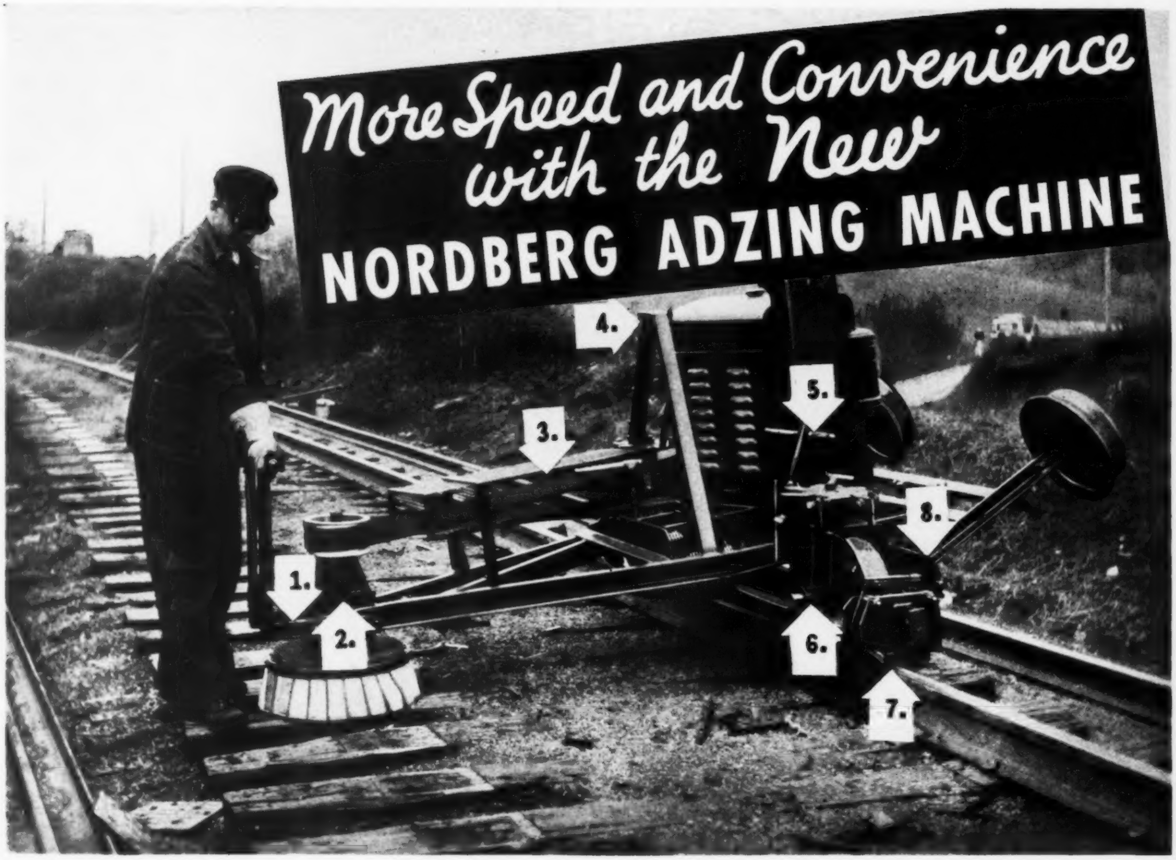
PERFECT GRIP ■ DROP FORGED STEEL ■ HOT DIP GALVANIZED
DEALERS WITH STOCK IN ALL PRINCIPAL CITIES

ALPHABETICAL INDEX TO ADVERTISERS



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incorporated in the new model gathered from suggestions made by maintenance men engaged in rail laying. These features assure of a better quality of adzing, faster progress, greater convenience and lower costs. Modernize your rail laying gangs by equipping them with new Adzing Machines.

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- Track Wrench
- Power Jack
- Surface Grinder
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- Precision Grinder
- Rail Drill
- Track Shifter

1. Correct setting of cutter head readily determined by built-in spirit level.
2. Spindle housing needs no adjustment for different heights or for canted rail.
3. Belt idler has been eliminated.
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5. Adjusting screws for changing for different heights of rail.
6. Truck wheels easily adjusted for variable centers of tieplates.
7. Readily adjustable guide rollers cause no interference at crossings.
8. Stand for supporting machine when changing cutter heads.

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